# General Test Equipment


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# Aniline Point and Mixed Aniline Point of Petroleum Products

*K10200 Automatic Aniline Point Apparatus*

## Ordering Information

| Catalog No. | | Order Qty |
|---|---|---|
| **K10200** | Automatic Aniline Point Apparatus, 115V 60Hz | 1 |
| **K10290** | Automatic Aniline Point Apparatus, 220-240V 50/60Hz | |

### Accessories

| | | |
|---|---|---|
| **250-000-33F** | ASTM 33F Thermometer Range: –36.5 to +107.5°F | 1 |
| **250-000-33C** | ASTM 33C Thermometer Range: –38 to +42°C | |
| **250-000-34F** | ASTM 34F Thermometer Range: 77 to 221°F | 1 |
| **250-000-34C** | ASTM 34C Thermometer Range: 25 to 105°C | |
| **250-000-35F** | ASTM 35F Thermometer Range: 194 to 338°F | 1 |
| **250-000-35C** | ASTM 35C Thermometer Range: 90 to 170°C | |
| **K10210** | Borosilicate Glass Test Cell with drain | |
| **K10220** | Heating-Cooling Tube with platinum element | |

***For NIST traceable certified thermometers, please refer to the ASTM Thermometer section on pages 184 through 191.***

## Aniline Point and Mixed Aniline Point of Petroleum Products and Hydrocarbon Solvents

### Test Method

**Aniline point is used to characterize pure hydrocarbons and to indicate the aromatic content of hydrocarbon mixtures. Equal volumes of aniline and sample or sample plus *n*-heptane are stirred together while being heated at a controlled rate. After the two phases become miscible, the mixture is cooled at a controlled rate and the temperature at which the two phases separate is the aniline point or mixed aniline point of the sample.**

### Automatic Aniline Point Apparatus

- Conforms to ASTM D611 and related specifications
- For samples ranging from clear to very dark
- Temperature range 0°C to 150°C (32°F to 302°F)
- Digital temperature display

Performs aniline point and mixed aniline point determinations automatically by means of a modified thin film technique (ASTM D611 Method E). The sample-aniline mixture is directly heated by a platinum immersion heater and the aniline point is detected photoelectrically. Temperature is displayed on a large LED indicator. Built-in pressure regulator and solenoid valve permit the use of cooling air for quicker cooling cycles or to determine subambient aniline point temperatures. Aniline points as low as 0°C (32°F) can be determined with the use of refrigerated cooling air. Equipped with variable controls for heater, light source and stirrer speed. Cabinet exterior surfaces have a chemical resistant polyurethane enamel finish.

### Specifications

Conforms to the specifications of:
ASTM D611; IP 2; ISO 2977; DIN 51775; FTM 791-3601; NF M 07-021
Testing Range: 0 to 150°C (32 to 302°F)
Temperature Display: 0-999.9°C
Electrical Requirements: CE
115V 60Hz, Single Phase, 0.4A
220-240V 50/60Hz, Single Phase, 0.2A

### Included Accessories

Standard Borosilicate Glass Test Cell with drain

### Dimensions lxwxh,in.(cm)

14½x8½x20¾ (37x22x53)
Net Weight: 32½ lbs (14.7kg)

### Shipping Information

Shipping Weight: 46 lbs (21kg)
Dimensions: 8.2 Cu. ft.

## Thin Film Aniline Point Apparatus

• Conforms to ASTM D611 and related specifications

For aniline point and mixed aniline point determinations according to Method B. Stirs aniline-sample mixture in a borosilicate glass thin film tube suspended in a heating bath. Thin film of mixture flows over a light well illuminated by a variable 6V lamp. Adjust heating rate per specifications using accessory Powertrol Heater. When lamp filament brightens inside well, allow mixture to cool until the two phases separate as indicated by obscuring of the lamp filament. Consists of thin film tube; 400mL Borosilicate Glass beaker; cover assembly with bath stirrer; sample pump rotor and cooling coil; 6V lamp with line cord; and drive motor. Positive drive pulley system rotates sample and bath stirrers. Accessory Powertrol Heater has variable stepless control and a reference dial for repeatable control of heating rate. Porcelain refractory top plate shields 1000W heater and has a positioning well for the Borosilicate Glass bath. Low voltage receptacle in heater housing accepts line cord of 6V lamp.

### Specifications

Conforms to the specifications of: ASTM D611; IP 2; ISO 2977;
DIN 51775; FTM 791-3601; NF M 07-021
Bath Medium: 400mL of heat transfer fluid
(355-001-001 mineral oil is suitable for this application)
Electrical Requirements: CE
115V 60Hz, Single Phase, 6.5A
220-240V 50/60Hz, Single Phase, 13.4A

### Included Accessories

Thermometer Ferrules (2)
Clamps and Support Rod

**Dimensions** lxwxh,in.(cm)
14½x18½x20¾ (37x22x53)
Net Weight: 24 lbs (10.9kg)

**Shipping Information**
Shipping Weight: 42 lbs (19.1kg)
Dimensions: 5.7 Cu. ft.

**Ordering Information**

| Catalog No. | | Order Qty |
|---|---|---|
| **K10190** | Thin Film Aniline Point Apparatus, 115V 60Hz | 1 |
| **K10191** | Thin Film Aniline Point Apparatus, 220-240V 50/60Hz | |
| **K10020** | Powertrol Heater, 115V 60Hz | 1 |
| **K10029** | Powertrol Heater, 220-240V 50/60Hz | |
| | **Accessories** | |
| **250-000-33F** | ASTM 33F Thermometer Range: –36.5 to +107.5°F | 2 |
| **250-000-33C** | ASTM 33C Thermometer Range: –38 to +42°C | |
| **250-000-34F** | ASTM 34F Thermometer Range: 77 to 221°F | 2 |
| **250-000-34C** | ASTM 34C Thermometer Range: 25 to 105°C | |
| **250-000-35F** | ASTM 35F Thermometer Range: 194 to 338°F | 2 |
| **250-000-35C** | ASTM 35C Thermometer Range: 90 to 170°C | |

*For NIST traceable certified thermometers, please refer to the ASTM Thermometer section on pages 184 through 191.*

*K10190 Thin Film Aniline Point Apparatus*

## U-Tube Aniline Point Apparatus

• Developed by Standard Inspection Laboratories

Similar to the Thin Film Aniline Point Apparatus but with 'U-Tube' aniline-sample tube and stirrer as developed by Standard Inspection Laboratories. Suitable for samples having 6.5 or lighter ASTM D1500 color. As illustrated in IP2-56, Method D. Consists of U-tube; 400mL Borosilicate Glass beaker; cover assembly with bath stirrer; sample stirrer and cooling coil; 6V lamp with line cord; and drive motor. Thermometer ferrules and mounting hardware are included. Accessory Powertrol Heater provides variable stepless control of heating rate and 6V tap for lamp.

**Ordering Information**

| Catalog No. | | Order Qty |
|---|---|---|
| **K10090** | U-Tube Aniline Point Apparatus 115V 60Hz | |
| **K10091** | U-Tube Aniline Point Apparatus 220-240V 50/60Hz | 1 |
| **K10020** | Powertrol Heater, 115V 60Hz | |
| **K10029** | Powertrol Heater, 220-240V 50/60Hz | 1 |

Koehler INSTRUMENT COMPANY, INC.

# Saybolt Color of Petroleum Products

*K13009 Saybolt Chromometer*

## Test Method

**The Saybolt Color test is used for quality control and product identification purposes on refined products having an ASTM Color of 0.5 or less. Products in this range include undyed motor and aviation gasolines, jet propulsion fuels, naphthas, kerosene and petroleum waxes. Color is an important quality characteristic for many products, and can also be used to detect product contamination. The Saybolt Chromometer measures color by comparing a column of sample against standard color discs. The Saybolt Wax Chromometer measures color of non-fluid waxes by heating the samples during the test.**

## Saybolt and Saybolt Wax Chromometers

- Conforms to ASTM D156 and related specifications
- Three-position color standard turret
- Tests non-fluid waxes and liquid petroleum products

Determines Saybolt Color of highly refined petroleum products. Consists of a matched set of sample and standard tube assemblies with optical viewer. Compares a sample of the product to be tested against standard color discs under a uniform light source. Reduce column height until the sample field is lighter than the color standard and convert height to Saybolt Color using chart on instrument. Three-position turret on standard tube permits convenient changing of color disc combinations. Accessory Daylight Lamp (Cat. No. K13010) provides standard light source per ASTM specifications.

For petroleum waxes, the Saybolt Wax Chromometer is equipped with heaters to keep waxes that are not fluid at ambient temperature molten during testing. Sample tube has a 200W chrome steel strip heater and a hinged cover to maintain even heat distribution. An aluminum block heater with 50W cartridge element keeps wax molten in the draincock assembly. Accessory variable transformer may be used to regulate the sample temperature. Optical viewer and stand are fully insulated from the heaters. Sample tube assembly has heat resistant fiber handles.

### Specifications

Conforms to the specifications of:
ASTM D156; DIN 51411; FTM 791-101; NF M 07-003
Electrical Requirements: CE
115V 60Hz
220-240V 50/60Hz

### Included Accessories

Whole Color Standards (3)
Half Color Standard (1)
Engraved Conversion Chart

### Dimensions lxwxh,in.(cm)

5½x5½x26½ (14x14x67)
Net Weight: 15½ lbs (7kg)

### Shipping Information

Shipping Weight: 31 lbs (14.1kg)
Dimensions: 4.0 Cu. ft.
*Includes accessory lamp*

### Ordering Information

| Catalog No. | | |
|---|---|---|
| **K13009** | Saybolt Chromometer | 1 |
| **K13100** | Saybolt Wax Chromometer, 115V 60Hz | 1 |
| **K13190** | Saybolt Wax Chromometer, 220-240V 50/60Hz | |
| | **Accessories** | |
| **K13010** | Daylight Lamp<br>Meets ASTM D156 and related test specifications for illumination of Saybolt Chromometers. Adjustable for correct positioning. Standard 60W bulb not included. | 1 |
| **K13020** | Whole Color Standard | |
| **K13029** | Half Color Standard | |
| **K13032** | Matched Set of Tubes with Turret<br>Assembly for K13009 Saybolt Chromometer | |
| **K13033** | Matched Set of Tubes with Turret and Draincock<br>Assembly for K13100/K13190 Saybolt Wax Chromometer | |
| **279-115-005** | Frosted Bulb, 60W, 115V | 1 |
| **279-230-002** | Frosted Bulb, 60W, 220-240V | |

# ASTM Color of Petroleum Products

## Test Method

**The ASTM color of petroleum products applies to products having an ASTM color of 0.5 or darker, including lubricating oils, heating oils and diesel fuel oils. (For products having an ASTM color lighter than 0.5, use the Saybolt Chromometer.) To determine ASTM color, the sample is compared against standard color discs in the Petroleum Colorimeter.**

## Petroleum Colorimeter

- Conforms to ASTM D1500 specifications

Single scale, 3-field petroleum comparator designed for visual color grading by direct comparison between the sample and colored glass filters housed in test discs conforming to the chromaticity coordinates of ASTM D1500. The sample and two consecutive glasses on the color scale are viewed simultaneously, making it easier to achieve the optimum color match. For rapid color grading within predetermined color limits, the glass standards can be set to the two limiting colors so that it is easy to check that the sample is within tolerance. The tungsten halogen light source is color corrected to CIE Standard Illuminant C, giving constant lighting conditions for color grading, regardless of ambient lighting. A prism brings the three fields together to aid color grading.

### Specifications

Conforms to the specifications of:
ASTM D1500, D6074; IP 196; ISO 2049; FTM 791-102
Electrical Requirements: CE
115V 60Hz
220-240V 50/60Hz

### Included Accessories

Glass Color Discs (2) Sample Container (3) Calibration Certificate

### Dimensions dxwxh,in.(cm)

10.5x9x5 (25x27x18)
Net Weight: 3.5 lbs (1.6kg)

### Shipping Information

Shipping Weight: 5.5 lbs (2.5kg)
Dimensions: 2.5 Cu. ft.

***K13200 Petroleum Colorimeter with K13210 Sample Containers (3 Included)***

**Ordering Information**

| Catalog No. | | Order Qty |
|---|---|---|
| **K13200** | Petroleum Colorimeter, 115V 60Hz | 1 |
| **K13290** | Petroleum Colorimeter, 220-240V 50/60Hz | |
| | **Accessories** | |
| **K13210** | Sample Container | |
| **K13223** | Replacement Tungsten Halogen Lamp, 12V 20W | |

# Visual Examination of Used Electrical Insulating Oils

## Visual Examination of Used Electrical Insulating Oils of Petroleum Origin in the Field

## Test Method

**Provides an estimate of the color and condition of in-service oils by visual observation and comparison with ASTM color standards in an oil comparator.**

## Oil Comparator

- Conforms to ASTM D1524 specifications
- Yields results equivalent to ASTM D1500

Complete ASTM oil color test outfit for comparison of oils against ASTM color standards. Includes two color discs, ranging from 0.5 to 5.0 in 10 steps and 5.0 to 8.0 in 7 steps. Magnifying prism brings the sample and standard color fields together for side by side comparison. Portable unit is suitable for laboratory or field use. Supplied with two precision 33mm rectangular glass cells, carrying case and instructions.

### Shipping Information

Shipping Weight: 10 lbs (4.5kg)
Dimensions: 1 Cu. ft.

**Ordering Information**

| Catalog No. | | Order Qty |
|---|---|---|
| **K13203** | Oil Comparator | 1 |
| | **Accessories** | |
| **K13204** | Daylight Illuminator, 115V Provides uniform lighting for Oil Comparator | 1 |
| **K13294** | Daylight Illuminator, 220-240V | |
| **K13205** | Rectangular Glass Cell | |

# Portable Automated Colorimeter

*K13260 Portable Automatic Colorimeter with*
*K13351 Cylindrical Cuvette and K13353 Rectangular Cuvettes (Both Sold Separately)*

## Portable Automated Colorimeter

- Conforms to ASTM D156, D1544, D1209, DIN 6162, and related international test specifications
- Measures the 4 most important color scales used for liquid chemicals, resins, oils, fuels, and fats for liquid color measurement
- Portable design for remote applications

Single-beam filter colorimeter system utilizes reference beam path technology to measure samples over eight spectral wavelengths ranged between 400 and 700nm in comparison to 4 standard color scales. Provides photometric high precision color measurements that are objective, accurate, and consistent over a wide variety of samples required for quality control programs. Measurements are initiated by just a single key press and require less than one minute to complete. The test results can be either displayed on the LCD screen or sent to an external printer. Please contact Koehler Customer Support for assistance on additional accessories required for your application.

### Color Ranges

- Saybolt Color (ASTM D156, NF M 07-003)
- Iodine Color (DIN 6162)
- Hazen Color, APHA Color, Pt/Co Color (ASTM D1209, ISO 6271)
- Gardner Color (ASTM D1544, ISO 4630)

### Specifications

Conforms to the specifications of:
ASTM D156, D1209, D1544, D6045; ISO 4630, 6271; DIN 6162; NF M 07-003; NF T 60-104; JIS K2580
Reproducibility: ±0.2% T (referenced to distilled water)
Reference Standard: distilled water
Data Output: RS232/printer
Light Source: krypton lamp

### Dimensions lxwxh,in.(cm)

7.9x10x3.5 (20x26x90)
Net Weight: 2.9 lbs (1.3kg)

### Shipping Information

Shipping Weight: 10 lbs (4.5kg)

### Electrical Requirements

115-240V 50/60Hz CE

| Ordering Information | |
|---|---|
| **Catalog No.** | |
| **K13260** | Portable Automatic Colorimeter |
| | **Accessories** |
| **K13551** | Starter Kit – Consists of Addista Color Standards; 50 x 10 Rectangular Cuvettes, Pk/10; Cuvette Set, 10 x 11mm round glass cuvettes |
| **K13550-1** | Thermal Printer with USB Connection |

# Automated Colorimeter for Saybolt and ASTM Color

*K13150 Automated Colorimeter*

## Saybolt and Mineral Oil Colorimeter

- Conforms to ASTM D156, D1500, D6045, and related test specifications
- Designed for color measurement of waxes and other petroleum products

High precision spectrophotometer for objective color analysis of petroleum fuels, oils, waxes and petrochemicals according to the Saybolt and ASTM Color scales. Test results can also be displayed in terms of CIE values and spectral data. The colorimeter is rugged with a fabricated steel housing which is designed to function equally as a QC instrument within the laboratory or on 24 hour operation in a production environment. A diagnostic test routine allows users to conduct periodic checks on the instrument or to identify faults. Direct access of the precision filament lamp from outside the instrument allows for easy replacement. The colorimeter is also supplied with a colored glass filter of known Saybolt value for regular conformance testing. Equipped with integrated heater unit for melting solid samples such as fats and waxes and preventing from solidification within the cell during testing.

### Specifications

Conforms to the specifications of:
ASTM D156, D1500, D6045, E 308; JIS K2580; ISO 2049; NF M 07-003
Reproducibility: ±0.25% T, ±1 Saybolt value
Spectral Range: 410-710 nm
Data Output: RS232/printer
Light Source: tungsten halogen lamp
Illuminant: CIE Illuminant C
Observer: 2°

### Electrical Requirements

115-240V 50/60Hz CE

### Dimensions lxwxh,in.(cm)

7.7x20.3x6.7 (19.5x51.5x17)
Net Weight: 17 lbs (7.75kg)

### Shipping Information

Shipping Weight: 23 lbs (10.5kg)

| Ordering Information | |
|---|---|
| **Catalog No.** | |
| **K13150** | Automatic Saybolt and ASTM Colorimeter, 115-240V 50/60 Hz |

## Automated Colorimeter

- Touch-screen TFT-Color Display
- Automatic cuvette recognition
- Data log for 500 color values, 50 color reference values, 500 photometric readings, 20 wavelength scans, 20 time scans
- Automatic zero calibration program
- Reference Beam Technology
- Password protection, GLP documentation
- USB-Ports: 1 x Type A and 1 x Type B

High performance, microprocessor controlled spectrophotometer with a wavelength range from 380 to 720 nm for color measurement or 320 nm up to 1100 nm for routine analysis. The K13550 can carry out an exact colorimetric evaluation in conformity with several ISO/ASTM standards with just a single measurement and display the result in terms of traditional color systems such as Iodine, Hazen/APHA or Gardner color numbers as well as in modern CIE-L*a*b* color values. Besides the over 20 color indexes, transmittance and absorbance can be measured at individual wavelengths, so that the K13550 can be used universally for analytical purposes in the laboratory.

### Color measurement methods:

- Iodine, Hazen, APHA, Pt/Co, Gardner-Color
- Saybolt, Klett-color
- Hess-Ives, ADMI, Yellowness-index
- AOCS-Red/Yellow, Chlorophyll A
- CIE-Lab, Hunter-Lab, XYZ
- European and US Pharmacopoeia

### Photometer methods:

- Wavelength Scan 320-1100nm incl. Difference Mode
- Time Course Mode
- Single and Multi Wavelength Mode

### Ordering Information

**Catalog No.**

| | |
|---|---|
| **K13550** | Automatic Colorimeter 115-240V, 50/60 Hz |

#### Accessories

| | |
|---|---|
| **K13551** | Starter Kit<br>Consists of Addista Color Standards; 50 x 10 Rectangular Cuvettes, Pk/10; Cuvette Set, 10 x 11mm round glass cuvettes |
| **K13552** | USB-Barcode Scanner (hand-held scanner) |
| **K13553** | Test filter set for stray light, absorbance and wavelength check |
| **K13554** | USB-Keyboard (keyboard layout: US) |
| **K13253** | Certified Testing solution set “Addista-Color” |
| **K13351** | Round cuvettes 11mm, glass, disposable, pk/500 |
| **K13353** | Rectangular cuvette 50 x 10mm, plastic, disposable, pk/50 |
| **K13349** | Rectangular cuvette 50 x 10mm with caps, plastic, disposable, pk/10 |
| **K13250-1** | Rectangular cuvette 50 x 10, glass, pk/1 |
| **K13500-3** | Rectangular cuvette 10 x 10, glass, pk/3 |
| **K13550-1** | Printer for K13550 |
| **K13356** | Rack for 7 50x10 cuvettes |

*Please use the K13250-1 Rectangular cuvette 50 x 10, glass, pk/1 or K13500-3 Rectangular cuvette 10 x 10, glass, pk/3 when testing hydrocarbons for color measurements. The disposable polycarbonate cuvettes are made for aqueous samples. Please ask you Koehler Sales Representative for details.*

***K13550 Automatic Colorimeter with K13351 Cylindrical Cuvettes and K13353 Rectangular Cuvette (Both Sold Separately)***

### Included Accessories:

- Universal power supply 100-240V, 50-60 Hz, with exchangeable plug adapters for EU, GB, US, China
- Dust Cover
- User Manual

### Specifications

Conforms to the specifications of:
ASTM D156, D1209, D1544, D1925, D5386, D6045, D6166; ISO 4630, 6271; DIN 5033, 6162, 6174; AOCS Cc 13e; USP Ch 631, 1061; Ph EUR; NF M 07-003; NF T 60-104
Spectral Bandwidth: 5 nm
Wavelength Reproducibility: 0.1nm
Wavelength Resolution: 1nm
Scanning Speed: 12 nm/s (in steps of 1 nm)
Stray Light: < 0.1% T at 340 nm with NaNO2
Color Measurement: 380-720nm in steps of 10nm
Wavelength Range: 320-1100nm in steps of 1nm
Wavelength Accuracy: +/- 1.5 nm (wavelength range 340-900 nm)
Photometric Measuring Range: +/- 3.5 Abs (wavelength range 340-900 nm)
Photometric Accuracy: 5 m Abs at 0.0 to 0.5 Abs
1% at 0.50 to 2.0 Abs
Photometric linearity: < 0.5% to 2 Abs
1% at > 2 Abs with neutral glass at 546 nm
Light Source: Gas-filled Tungsten (visible)

### Dimensions lxwxh,in.(cm)

14.5 x 14.1 x 5.7 (36.8 x 35.9 x 14.4)
Net Weight: 14.11 lbs (6.4 kg)

### Shipping Information

Shipping Weight: 18 lbs (8.2 kg)
Dimensions:20x16x16in.

### Electrical Requirements

115-240V, 50/60 Hz CE

Koehler INSTRUMENT COMPANY, INC.

# Density, Relative Density (Specific Gravity), or API Gravity

## Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method

### ASTM Hydrometers

For density, relative density (specific gravity) or API gravity determination of crude petroleum, liquid petroleum products and mixtures of petroleum and non-petroleum products. For density of LPG and light hydrocarbons refer to page 103.

#### Specifications

Conforming to the specifications of: ASTM E100

#### Applicable Test Method Standards:

ASTM D287, D1298, D6074, D6158;
API MPMS Chapter 9.1; IP 160; ISO 3675; DIN 51757

### API Gravity Hydrometers

Standard temperature 60°F, subdivisions 0.1° API, length 330mm

| Catalog No. | ASTM Hydrometer No. | Nominal API Gravity Range, deg. |
|---|---|---|
| **251-000-01H** | 1H | –1 to +11 |
| **251-000-02H** | 2H | 9 to 21 |
| **251-000-03H** | 3H | 19 to 31 |
| **251-000-04H** | 4H | 29 to 41 |
| **251-000-05H** | 5H | 39 to 51 |
| **251-000-06H** | 6H | 49 to 61 |
| **251-000-07H** | 7H | 59 to 71 |
| **251-000-08H** | 8H | 69 to 81 |
| **251-000-09H** | 9H | 79 to 91 |
| **251-000-10H** | 10H | 89 to 101 |

### Specific Gravity Hydrometers

Standard temperature 60/60°F, subdivisions 0.0005, length 330mm

| Catalog No. | ASTM Hydrometer No. | Nominal Specific Gravity Range |
|---|---|---|
| **251-000-82H** | 82H | 0.650 to 0.700 |
| **251-000-83H** | 83H | 0.700 to 0.750 |
| **251-000-84H** | 84H | 0.750 to 0.800 |
| **251-000-85H** | 85H | 0.800 to 0.850 |
| **251-000-86H** | 86H | 0.850 to 0.900 |
| **251-000-87H** | 87H | 0.900 to 0.950 |
| **251-000-88H** | 88H | 0.950 to 1.000 |
| **251-000-89H** | 89H | 1.000 to 1.050 |
| **251-000-90H** | 90H | 1.050 to 1.100 |

***Calibrated hydrometers and thermohydrometers are available from Koehler with an ISO/IEC 17025 and ANSI/NCSL Z-540-1 Report of Calibration.***

***When inquiring about calibrated hydrometers and thermohydrometers, please refer to the catalog number for the corresponding hydrometer/ thermohydrometer and replace the middle three zeros in the catalog number with 004. Example: 251-000-01H API Gravity Hydrometer would be 251-004-01H Certified API Gravity Hydrometer.***

### API Gravity Hydrometers

Standard temperature 60°F, subdivisions, 0.1° API, length 330mm

| Catalog No. | ASTM Hydrometer No. | Nominal API Gravity Range, deg. |
|---|---|---|
| **251-000-21H** | 21H | 0 to 6 |
| **251-000-22H** | 22H | 5 to 11 |
| **251-000-23H** | 23H | 10 to 16 |
| **251-000-24H** | 24H | 15 to 21 |
| **251-000-25H** | 25H | 20 to 26 |
| **251-000-26H** | 26H | 25 to 31 |
| **251-000-27H** | 27H | 30 to 36 |
| **251-000-28H** | 28H | 35 to 41 |
| **251-000-29H** | 29H | 40 to 46 |
| **251-000-30H** | 30H | 45 to 51 |
| **251-000-31H** | 31H | 50 to 56 |
| **251-000-32H** | 32H | 55 to 61 |
| **251-000-33H** | 33H | 60 to 66 |
| **251-000-34H** | 34H | 65 to 71 |
| **251-000-35H** | 35H | 70 to 76 |
| **251-000-36H** | 36H | 75 to 81 |
| **251-000-37H** | 37H | 80 to 86 |
| **251-000-38H** | 38H | 85 to 91 |
| **251-000-39H** | 39H | 90 to 96 |
| **251-000-40H** | 40H | 95 to 101 |

### API Gravity Thermohydrometers - Thermometer in Body

Standard temperature 60°F, subdivisions 0.1° API, length 380mm, thermometer scale °F 0-150 (designation L), 30 to 180 (designation M), 60 to 220 (designation H)

| Catalog No. | ASTM Thermohydrometer No. | Nominal API Gravity Range, deg. |
|---|---|---|
| **251-000-51HH** | 51HH | –1 to 11 |
| **251-000-51HL** | 51HL | –1 to 11 |
| **251-000-52HH** | 52HH | 9 to 21 |
| **251-000-52HL** | 52HL | 9 to 21 |
| **251-000-53HM** | 53HM | 19 to 31 |
| **251-000-53HL** | 53HL | 19 to 31 |
| **251-000-54HM** | 54HM | 29 to 41 |
| **251-000-54HL** | 54HL | 29 to 41 |
| **251-000-55HL** | 55HL | 39 to 51 |
| **251-000-56HL** | 56HL | 49 to 61 |
| **251-000-57HL** | 57HL | 59 to 71 |
| **251-000-58HL** | 58HL | 69 to 81 |
| **251-000-59HL** | 59HL | 79 to 91 |
| **251-000-60HL** | 60HL | 89 to 101 |

### API Gravity Thermohydrometers - Thermometer in Stem

Standard temperature 60°F, subdivisions 0.1° API, length 380mm, temperature scale °F 30-220

| Catalog No. | ASTM Thermohydrometer No. | Nominal API Gravity Range, deg. |
|---|---|---|
| **251-000-71H** | 71H | –1 to 11 |
| **251-000-72H** | 72H | 9 to 21 |
| **251-000-73H** | 73H | 19 to 31 |
| **251-000-74H** | 74H | 29 to 41 |

# Density, Relative Density (Specific Gravity), or API Gravity

## Specific Gravity Hydrometers

Standard temperature 60/60°F, subdivisions 0.001 length 260mm

| Catalog No. | ASTM Hydrometer No. | Nominal Specific Gravity Range |
|---|---|---|
| 251-000-102H | 102H | 0.650 to 0.700 |
| 251-000-103H | 103H | 0.700 to 0.750 |
| 251-000-104H | 104H | 0.750 to 0.800 |
| 251-000-105H | 105H | 0.800 to 0.850 |
| 251-000-106H | 106H | 0.850 to 0.900 |
| 251-000-107H | 107H | 0.900 to 0.950 |
| 251-000-108H | 108H | 0.950 to 1.000 |
| 251-000-125H | 125H | 1.000 to 1.050 |
| 251-000-126H | 126H | 1.050 to 1.100 |
| 251-000-127H | 127H | 1.100 to 1.150 |
| 251-000-128H | 128H | 1.150 to 1.200 |
| 251-000-129H | 129H | 1.200 to 1.250 |
| 251-000-130H | 130H | 1.250 to 1.300 |
| 251-000-131H | 131H | 1.300 to 1.350 |
| 251-000-132H | 132H | 1.350 to 1.400 |
| 251-000-133H | 133H | 1.400 to 1.450 |
| 251-000-134H | 134H | 1.450 to 1.500 |
| 251-000-135H | 135H | 1.500 to 1.550 |
| 251-000-136H | 136H | 1.550 to 1.600 |
| 251-000-137H | 137H | 1.600 to 1.650 |
| 251-000-138H | 138H | 1.650 to 1.700 |
| 251-000-139H | 139H | 1.700 to 1.750 |
| 251-000-140H | 140H | 1.750 to 1.800 |
| 251-000-141H | 141H | 1.800 to 1.850 |

## ASTM Metric Thermohydrometers

Standard temperature 15°C, subdivisions 0.5kg/m$^3$, length 380mm, thermometer scale °C: –20 to +65 (designation L), 0 to 85 (designation M), 20 to 105 (designation H).

| Catalog No. | ASTM Thermohydrometer No. | Density, Range kg/m$^3$ |
|---|---|---|
| 251-000-300HL | 300HL | 600 to 650 |
| 251-000-301HL | 301HL | 650 to 700 |
| 251-000-302HL | 302HL | 700 to 750 |
| 251-000-302HM | 302HM | 700 to 750 |
| 251-000-303HL | 303HL | 750 to 800 |
| 251-000-303HM | 303HM | 750 to 800 |
| 251-000-304HL | 304HL | 800 to 850 |
| 251-000-304HM | 304HM | 800 to 850 |
| 251-000-305HL | 305HL | 850 to 900 |
| 251-000-305HM | 305HM | 850 to 900 |
| 251-000-306HL | 306HL | 900 to 950 |
| 251-000-306HM | 306HM | 900 to 950 |
| 251-000-307HL | 307HL | 950 to 1000 |
| 251-000-307HH | 307HH | 950 to 1000 |
| 251-000-308HH | 308HH | 1000 to 1050 |
| 251-000-308HL | 308HL | 1000 to 1050 |
| 251-000-309HH | 309HH | 1050 to 1100 |
| 251-000-309HL | 309HL | 1050 to 1100 |

## Hydrometer Cylinders*

- Wide base for maximum stability
- Convenient pour-out lip
- Choice of glass or metal construction

*K26300 Brass Hydrometer Cylinder*

### Ordering Information

| Catalog No. | Construction | Dimensions dia.xh. |
|---|---|---|
| K26300 | Brass | 2½x12" (64x305mm) |
| K26390 | Brass | 2x15" (51x381mm) |
| 332-002-011 | Glass | 2x15½" (51x394mm) |

**Not suitable for use with K26400 series baths*

***Calibrated hydrometers and thermohydrometers are available from Koehler with an ISO/IEC 17025 and ANSI/NCSL Z-540-1 Report of Calibration.***

***When inquiring about calibrated hydrometers and thermohydrometers, please refer to the catalog number for the corresponding hydrometer/thermohydrometer and replace the middle three zeros in the catalog number with 004. Example: 251-000-01H API Gravity Hydrometer would be 251-004-01H Certified API Gravity Hydrometer.***

***For NIST traceable certified thermometers, please refer to the ASTM Thermometer section on pages 184 through 191.***

# Density, Relative Density (Specific Gravity), or API Gravity

## Constant Temperature Hydrometer Bath

- Holds 12 hydrometer cylinders
- Can be used for Reid Vapor Pressure immersion type cylinders
- Conforms to ASTM D323, D1298, D6074, D6158 and related specifications

A versatile constant temperature bath designed for density/gravity determinations of petroleum products at temperatures of up to 195°F (90°C), and also for Reid Vapor Pressure determinations using immersion bombs. Microprocessor PID control provides quick temperature stabilization without overshoot and the unit is protected by an overtemperature control circuit that interrupts power should bath temperature exceed a programmed cut-off point. Dual LED displays provide actual and setpoint temperature values in °C/°F. *Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Contact your Koehler representative for information.*

*Also available–Special bath to accommodate both ASTM D323 (Vapor Pressure of Petroleum Products–Reid Method listed on page 93) and D942 (Oxidation Stability of Lubricating Greases by the Oxygen Bomb Method listed on pages 152-153), as well as D525 (Oxidation Stability of Gasoline–Induction Method listed on pages 81-82). Please contact a Koehler Customer Service representative for additional information.*

**Dimensions** lxwxh,in.(cm)
30x14x28 (76x36x71)
Net Weight: 64 Lbs (29.0kg)

**Shipping Information**
Shipping Weight: 118 lbs (53.5kg)
Dimensions: 11.4 Cu. ft.

### Specifications

Capacity: twelve (12) hydrometer cylinders (without base)
or Reid Vapor Pressure one-opening type bombs
Temperature Range: ambient to 250°F (121°C)
Temperature Control Stability: ±0.2°F (±0.17°C)
Heater Range: 0-2500W
Bath Medium: 19 gal (71.9L) water
Electrical Requirements: CE
115V 60Hz, Single Phase, 22A
230V 50/60Hz, Single Phase, 11A

### Ordering Information

| Catalog No. | | Order Qty |
|---|---|---|
| **K26400** | Constant Temperature Hydrometer Bath, 115V 60Hz | 1 |
| **K26490** | Constant Temperature Hydrometer Bath, 230V 50/60Hz | |

**Accessories**

| | | |
|---|---|---|
| **K26410** | Hydrometer Cylinder<br>Borosilicate glass, 15½"lx2"dia. with 2½" lip | 12 |
| **250-000-61F** | ASTM 61F Thermometer<br>Range: 90 to 260°F | 1 |
| **250-000-61C** | ASTM 61C Thermometer<br>Range: 32 to 127°C | |

***For NIST traceable certified thermometers, please refer to the ASTM Thermometer section on pages 184 through 191.***

# Density, Relative Density (Specific Gravity), or API Gravity

## Constant Temperature Hydrometer Bath

- Accommodates one standard 2"x15" (51x380mm) hydrometer cylinder with base
- Compact design saves space

Thermostatically controlled water bath with 500W copper immersion heater and hydraulic thermoregulator for operation at temperatures of up to 210 ±2°F (99±1°C). Holds one 2"x15" (51x381mm) hydrometer jar — top of jar extends 1½" (38mm) above the top of the bath for easy viewing of the hydrometer. Insulated double-wall construction with stainless steel tank and shelf and finished steel exterior. Has variable speed control for magnetic stirrer, temperature control dial, and on/off switches for motor and power.

### Specifications

Temperature Range: Ambient to 210°F (99°C)
Temperature Control Stability: ±2°F (±1°C)
Bath Medium: 2 gal (7.57L) water
Electrical Requirements: CE
115V 60Hz, Single Phase, 4.3A
230V 50/60Hz, Single Phase, 2.2A

**Dimensions** dia.xh.(cm)
Bath Interior: 6x16½ (15x42)
Overall: 9x22 (23x56)
Net Weight: 20 lbs (9.1kg)

**Shipping Information**
Shipping Weight: 35 lbs (15.9kg)
Dimensions: 5 Cu. ft.

### Ordering Information

| Catalog No. | |
|---|---|
| **K26200** | Constant Temperature Hydrometer Bath, 115V 60Hz |
| **K26290** | Constant Temperature Hydrometer Bath, 230V 50/60Hz |

*K26200 Hydrometer Bath*

# Coulometric Karl Fischer Titrator

## Test Method

**Determines low concentrations of water in a wide range of liquid, gas and powder samples. Used for assessing water content in petroleum and petrochemical products including oils, gasolines, solvents, and fluids as well as other products such as pharmaceuticals and cosmetics.**

## Coulometric Karl Fischer Titrator

- ASTM D 1533, D4928, D6304, IP 386, IP 438, API MPMS Chap. 10.9, BS 60814, ISO 10101-3, ISO 10337, ISO 12937
- Simple operation
- Multi-language display and print out
- Integral high-speed thermal printer
- Small footprint
- Automatic Compensation of Errors

The AKF5000 offers new standards in versatility and ease of operation. Providing fast, accurate and reproducible determinations of water content in liquids, gases and powders. This easy to use titrator incorporates many state-of-the-art features. Designed to be equally suitable for meeting the routine needs of the Quality Control laboratory or the more demanding and varied requirements of research applications. Hard copies of results are provided by the built in high-speed thermal printer, along with statistics, data input parameters, sample ID numbers and time/date of analysis.

### Ordering Information

| Catalog No. | |
|---|---|
| **K90365** | AKF5000 Compact Coulometric Karl Fischer Titrator, 115-240V 50/60Hz |

### Included Accessories

Glassware pack comprising twin port titration vessel, detector electrode, generator electrode, dessicant tube, molecular seive, stirrer bar, injection septa, funnel & 1ml glass syringe with luer needle.

### Accessories

| | |
|---|---|
| **K90365-7** | Gas Analysis Kit (Comprised of gas inlet, gas outlet, seal ring & cap) |
| **K90365-8** | Carry Case |
| **K90365-20** | Formula Reagent Kit (Pack of 8 x 100ml anode reagent, 8 x 5ml cathode reagent) |
| **K90365-35** | Water Standard, 0.1 mg/ml, 5ml, pk/10 |
| **K90365-36** | Water Standard, 1.0 mg/ml, 5ml, pk/10 |

### Specifications and Features

Titration method: Coulometric Karl Fischer titration
End point detection: AC polarisation
End point indication: Visual display/print out/acoustic beep
Display: 40 character alphanumeric backlit LCD
Measuring range (possible): 1µg – 100mg water
Measuring range (typical): 1µg – 10mg water
Moisture range: 1 ppm – 100%
Max. sensitivity: 0.1 µg
Max. titration speed: 2.0 mg per minute
Max. current: 400 ma
Drift compensation: Automatically controlled
Start delay time: 0 - 30 minutes, user selectable
End delay time: 0 - 30 minutes, user selectable
Power supply: 90-264VAC, 47-63Hz Universal input CE
Precision: 10-100µg ±3µg, 100µg-1mg ±5µg, above 1mg ±0.5%
Calculation modes: Weight/weight, user programmable
Weight/dilution ratio, user programmable
Volume/density, user programmable
Volume/volume, user programmable
Display format: µg, mg/kg, ppm, %
Print format: µg, mg/kg, ppm, %
Statistics: max, mean, min values upto 99 runs
Method storage: 10 user programmable methods
Sample ID number: user programmable
Printer: 42 character high-speed thermal printer
Stirrer speed: Microprocessor controlled
Dimensions: 250 x 245 x 120 mm
Weight: 3 kg
Language: English, Francais, Espanol, Portugues, Deutsch and Magyar
Calendar/clock: Analysis time and date print out

# Automatic Flocculation Titrimeter

## Test Method

**Samples of asphalt or heavy oil, or residuum are dissolved in toluene at various concentrations and titrated with iso-octane or n-heptane at controlled temperatures to determine the point of flocculation (asphaltene precipitation) and calculate the Heithaus compatibility parameters. These results are intended primarily as a laboratory diagnostic tool for estimating the colloidal stability or compatibility of asphalt, asphalt cross blends, aged asphalt, pyrolyzed asphalt, crudes, and heavy oil (residuum). The stability values will allow the refiner to increase yields by allowing longer retention time in process. The compatibility values will allow blending of crudes so as to prevent asphaltene formation during blending and storage. Both of these parameters are of utmost importance when we consider the price of crude in today's market.**

## Automated Flocculation Titrimeter

- Complete instrument and data acquisition system
- Rapid, accurate and highly reproducible
- Determines blending insolubility and solubility numbers
- Generates the data to calculate the WRI Coking Index (patent pending) to predict the proximity to coke formation during heavy oil distillation and improve distillate yield

The Automated Flocculation Titrimeter (AFT) is a highly automated, computerized instrument that acquires oil stability and compatibility parameters directly. The AFT can be used to perform ASTM D6703 test method for Automated Heithaus Titrimetry. The instrument operates as a closed system with accurately controlled temperatures between 20-100°C, important for properly determining Heithaus compatibility parameters. The flocculation point is determined spectroscopically and the results are analyzed by the data acquisition system, virtually eliminating operator error in the interpretation of endpoints. A key benefit to the user is the fact that the asphaltene concentration can be calculated by the software much faster that tradition methods and with more accuracy. The utility of the original Heithaus method has been expanded by developing multiple titration schemes. The software uses the data from the expanded method to predict the proximity to coke formation during heavy oil distillation. Many refiners stop distillation short of coke formation to avoid fouling in distillation equipment, tanks and transfer lines. The expanded AFT methodology allows the refiner to recover additional distillate without the fear of fouling. This attribute of the instrument should allow up to a 1-2% increase in yields if applied to a process. Conversely, the added benefit of being able to predict coking tendency, would prevent fouling of the process and thus decrease the use of energy in production as well as reduce down time due to having to clean vessels after fouling.

One of the primary uses of Heithaus values is to predict the compatibility (P Index) of which oils and petroleum residua or asphalts can be mixed together for shipping, processing, or in formulations without causing phase separation. This is valuable to the refiner, researcher, or asphalt jobber who supplies petroleum asphalts for highway and roofing applications because it ensures that compatible asphalt blends are supplied. Incompatible asphalts show early failure in both applications.

**Coking Index (US Patent 6,773,921)**-Stability also influences coke formation in the refining process. Another major use for the AFT is to acquire the data needed to employ the Coking Index. The Coking Index is a quantitative measure of the proximity to coking (fouling) during visbreaking, distillation, transfer and storage of heavy oil. This allows the petroleum refiner to optimize heavy oil processing and to recover the maximum amount of distillate, and to stop the processing before fouling occurs.

**Solubility Parameter**-The solubility parameter at which asphaltenes begin to precipitate and the solubility parameter of the whole oil can be calculated from the AFT data.

*K47100 Automated Flocculation Titrimeter*

### Specifications

Conforms to the specifications of:
ASTM D6703
Temperature Range: 20 to 100°C
Electrical Requirements: CE
115V 60Hz
220-240V 50/60Hz

### Included Accessories

External Desktop PC with Data Acquisition Software
Fiber Optic Spectrometer with Multi-Bandpass Detector
High and Low Flow Rate Metering Pumps
Magnetic Stirring Plates
Programmable Circulator with External Probe to Monitor Jacket Temperature of the Sample
Reaction Vessels
Quartz Flow Cell with Temperature Stability Feature
Glassware
Thermometer Probes
Digital Variable Sample Circulator with Built in Reverse

### Shipping Information

Shipping Weight: 40 lbs (18.1kg)
Dimensions: 11 Cu. ft.

### Dimensions lxwxh,in.(cm)

Base/Support Assembly: 12x24x36 (30.5x61x91.4)

### Ordering Information

| Catalog No. | |
|---|---|
| **K47100** | Automated Flocculation Titrimeter, 115V 60Hz |
| **K47190** | Automated Flocculation Titrimeter, 230V 50/60Hz |

In collaboration with Western Research Institute

# Distillation of Petroleum Products at Reduced Pressure

## Test Method

**Determines the range of boiling points for petroleum products that can be partially or completely vaporized at a maximum liquid temperature of 400°C at reduced pressures. The sample is distilled at a controlled, reduced pressure under conditions that are designed to provide approximately one theoretical plate fractionation. Initial and final boiling point is measured and a distillation curve relating volume percent distilled and the atmospheric equivalent boiling point temperature can be prepared.**

## VDS3000 Manual Vacuum Distillation System

- Conforms to ASTM D1160 and related specifications
- Comes standard with glassware set and accessories kit for "Turn-Key" set up and operation
- Sturdy cabinet composed of aluminum frame and cold rolled steel walls
- Control Unit can easily attach and detach from the main unit offering versatility for laboratory workspace
- Clear protective door provides added safety while allowing the operator full view of the system during testing
- Equipped with digital temperature and vacuum displays for improved measurement reading and accuracy
- Upgrade to glassware set composed entirely of quartz available upon request

The Koehler VDS3000 Manual Vacuum Distillation System is the latest design for determining, at reduced pressures, the range of boiling points for petroleum products according to ASTM D1160 and related specifications. The main body of the system or cabinet is composed of an aluminum frame and cold rolled steel walls. The base of the cabinet houses a 5 Liter Stainless Steel Surge Tank to reduce pressure fluctuations during testing. The control unit of the system features a versatile, compact, modern design. Dual temperature displays independently show both the overhead and flask temperature of the system. Built in cooling fan rapidly cools the distilling flask allowing the user to handle glassware and shorten turnaround time in between test runs. Equipped with complete glassware set and accessories kit for "Turn-Key" installation and operation of the Vacuum Distillation System.

The Standard Glassware Set consists of 500mL quartz distilling flask with thermowell, vacuum jacketed distilling column and condenser assembly, water jacketed receiving cylinder, 90° elbow adapter tube, Dewar-Type Cold Trap with 10mL graduated receiver and stopcock drain, PT100 probe adapter, PT100 vapor temperature probe and PT100 flask temperature probe. The system also includes an adjustable scissor jack, heating mantle, retaining springs, ball joint clamps, connection tubing, hose clamps, quick connect adapters and fittings for easy connection of jacketed glassware and tubing and vacuum grease.

## Specifications

Conforms to the specifications of:
ASTM D1160; ISO 6616; JIS K2254
Temperature Range: Ambient to 425°C (797°F)
Temperature Display: 0.1°C resolution
Temperature Accuracy: ±0.5°C
Vacuum Range: 0.1 Torr to Atmospheric Pressure (760 Torr)
Vacuum Display: 0.1 Torr resolution
Vacuum Accuracy: ± 0.2 Torr
External Circulator Temperature Range: Ambient +5°C to 150°C
Electrical Requirements: CE
115V 60Hz
220-240V 50/60Hz

*K80300 VDS3000 Vacuum Distillation System*

Vacuum Pump and Refrigerated Constant Temperature Circulation Bath are not included with the VDS3000 System but are available from Koehler Instrument Company, Inc. Please refer to Recommended Accessories in the Ordering Information Section for details. Side shelf for housing the Vacuum Pump and Circulation bath is also available upon request.

## Shipping Information

Shipping Weight: 120 lbs
Dimensions: 15 Cu.ft.

## Dimensions wxdxh,in.(cm)

Cabinet: 29½x 9¼ x 32½ (75 x 23.5 x 82.6)
Control Box: 7¾ x 9¼ x 9¾ (19.7 x 23.5 24.7)
Net Weight:
Cabinet: 62 lbs (28.2 kg)
Control Box: 21 lbs (9.6 kg)

## Ordering Information

| Catalog No. | | Order Qty |
|---|---|---|
| **K80300** | VDS3000 Manual Vacuum Distillation System 115V 60Hz | 1 |
| **K80390** | VDS3000 Manual Vacuum Distillation System 220-240V 50/60Hz | |
| | **Accessories** | |
| **K80320** | VDS Vacuum Pump with Kit Consists of Vacuum Pump, Hose Nozzle, Centering O-Ring, Hinged Clamp, Outlet Filter, Filter O-Ring, Filter Clamp, 1 Liter Vacuum Oil, Connection Tubing, Hose Clamp (2) | 1 |
| **K33062** | Standard Constant Temperature Circulation Bath, 115V 60Hz | |
| **K33063** | Standard Constant Temperature Circulation Bath, 220-240V 50/60Hz | |

Koehler INSTRUMENT COMPANY, INC.

# Automatic and Semi-Automatic Vacuum Distillation of Petroleum Products

## Test Method

**Determines the range of boiling points for petroleum products that can be partially or completely vaporized at a maximum liquid temperature of 400°C at reduced pressures. The sample is distilled at a controlled, reduced pressure under conditions that are designed to provide approximately one theoretical plate fractionation. Initial and final boiling point is measured and a distillation curve relating volume percent distilled and the atmospheric equivalent boiling point temperature can be prepared.**

## Automatic Vacuum Distillation System

- Fully Automatic Operation
- Simple to Operate and Maintain
- Vacuum Step Down Inhibits Foaming
- Easy Access to all Components
- Safety Shields & Doors Protect Operator
- Turn Key System
- High Precision and Accuracy
- Automatic Cleaning Cycle
- Receiver is Easy to Remove
- PC Control

The Automatic Vacuum Distillation System is designed to make vacuum distillation easy, safe and affordable. The self contained unit is controlled by a standard PC. Fully automatic function minimizes the amount of operator time needed for the test.

The latest Windows® operating system is included along with a state of the art PC. The Windows®-based software is intuitive and guides you through the distillation step by step. All data is saved to the hard drive in standard format that can be easily opened by spread sheets or exported to LIMS. Files can be accessed through portable USB drives, Ethernet connection or written to a CD/DVD. A color printer is provided to print hard copies of the reports. Process diagrams clearly show the current equipment status. Results can be viewed as the distillation proceeds in both tables and graphs. Distillation parameters can be modified at any time during the distillation.

## Semi-Automatic Vacuum Distillation System

- Automatic Vacuum Control
- Automatic Heat Control
- Vapor Temperature Display
- Pot Temperature Display
- Automatic shutdown for high pot or vapor temperature

The Semi-Automatic Vacuum Distillation System features standard ASTM D1160 glassware enhanced with microprocessor control. The vacuum level, bath temperature and heating rates are programmable with up to 50 stored programs. Vapor temperature, distilling flask temperature and vacuum level are digitally displayed. Optional PC interface allows the distillation to be controlled from a PC and for data to be stored on the PC.

### Specifications

Conforms to the Specifications of:
ASTM D1160; ISO 6616
Distillation Temperature Range:
Ambient to 400°C (752°F)
Condenser Temperature Range:
Ambient +5°C to 150°C
Vacuum Range:
1.00 mmHg to 50 mmHg (0.13 to 6.7 kPa)
Electrical Requirements:
220-240V 50/60Hz

**Ordering Information**

| Catalog No. | |
|---|---|
| **K87170** | Automatic Vacuum Distillation System, 220-240V 50/60Hz |
| **K87180** | Semi-Automatic Vacuum Distillation System, 220-240V 50/60Hz |

# Automatic and Semi-Automatic Vacuum Distillation of Crude Oil

## Test Method

**ASTM D2892 covers the procedure for the distillation of stabilized crude petroleum (see Note 1) to a final cut temperature of 400°C Atmospheric Equivalent Temperature (AET). This test method employs a fractionating column having an efficiency of 14 to 18 theoretical plates operated at a reflux ratio of 5:1.**

**ASTM D5236 covers the procedure for the distillation of heavy hydrocarbon mixtures having initial boiling points greater than 150°C (300°F), such as heavy crude oils, petroleum distillates, residues, and synthetic mixtures. It employs a potstill with a low pressure drop entrainment separator operated under total takeoff conditions. Distillation conditions and equipment performance criteria are specified and typical apparatus is illustrated.**

## Automatic Crude Oil Vacuum Distillation System

- Ergonomic Design makes the distillation system easy to use with easy access to all components
- The Windows®-based software is intuitive and guides you through the distillation process in a logical step-by-step fashion

The Automatic Crude Oil Vacuum Distillation System is a fully automatic crude oil distillation system that complies with ASTM D2892 and D5236. The distillation process is automated from beginning to end, minimizing the time needed to operate the equipment. Its fully customizable modular design allows for multiple configurations and easy switching from ASTM D2892 and D5236. Please contact your Koehler representative for required method and corresponding flask size and type.

## Semi-Automatic Crude Oil Vacuum Distillation System

- Highly Automated - Minimizes operator time and makes test easier to perform
- Complete System - Includes all equipment needed to perform a distillation

Fully Automatic Functions include Vacuum Control, Fraction Collector, Condenser Bath Temperature, Heat Control of Column Heated Jacket, Shut Down at End of Distillation, Reflux Ratio and AET Vapor Temperature Calculation. Semi-Automatic Functions include Heat Control for Boiling Flask. Manually Controlled Functions include Measurement of Receiver Volume and Creation of Volume vs. Temperature Distillation Curve.

The Semi-Automatic Crude Oil Vacuum Distillation system can come in a wide variety of configurations with single or multiple distillation columns. Please contact your Koehler representative for required test method and configuration.

## Test Method

**The sample is evaporated and condensed under controlled conditions, and observations are made of the temperatures at which various percentages are recovered and/or the percentages recovered at specified temperatures.**

## Front View Distillation Apparatus

- Conforms to ASTM D86, E133 and related ASTM and international standards
- Choice of three different models

**Front View Distillation Apparatus, Groups 1, 2 and 3**–Meets all ASTM and related specifications for distillation of motor and aviation gasolines, aviation turbine fuels, naphthas, kerosenes, distillate fuels, natural gasoline, liquid hydrocarbon mixtures and other petroleum products. Consists of fully insulated stainless steel condenser and heater units. Heater unit includes flask support platform, viewing window, 1250W heater with stepless variable control, and rack and pinion heater elevation mechanism with push-turn control knob. *Please inquire about higher wattage heaters.* White receiving flask background facilitates viewing of fractions during test. Available with right-hand or left-hand heater unit for convenient pairing. Includes graduate support block and flask support boards.

**Group 4 Front View Distillation Apparatus**–Front View Distillation apparatus designed for testing of Grade No. 2 fuel oil, Grade No. 2-D diesel fuel oil, gas oils and other distillates requiring condenser bath temperatures of up to 140°F (60°C). Also suitable for gasolines, aviation turbine fuels, naphthas, kerosenes and other liquid petroleum products. Similar in features and construction to the standard Front View Distillation Apparatus, but equipped with a 300W copper immersion condenser heater with stepless electronic control. Available with right or left-hand heater unit. *Note: The Group 4 Apparatus can also run distillations for petroleum products categorized as Groups 1, 2 and 3.*

### Specifications

Conforms to the specifications of:
ASTM D86, D216, D233, D447, D850, D1078, E133; IP 123, 195; ISO 3405; DIN 51751; FTM 791-1001, 791-1015; NF M 07-002
Electrical Requirements: CE
115V 60Hz
220-240V 50/60Hz

### Included Accessories

Flask Support Boards A and C
Graduate Cylinder Support Block

### Shipping Information

Shipping Weight: 65 lbs (29.5kg)
Dimensions: 13.3 Cu. ft.

### Dimensions lxwxh,in.(cm)

15¼x18¼x19½ (39x46x50)

*K45090 Front View Distillation Apparatus*

### Ordering Information

| Catalog No. | |
|---|---|
| **Front View Distillation Apparatus** | |
| **K45000** | Right-Hand Model, 115V 60Hz |
| **K45100** | Left-Hand Model, 115V 60Hz |
| **K45090** | Right-Hand Model, 220-240V 50/60Hz |
| **K45190** | Left-Hand Model, 220-240V 50/60Hz |
| **Group 4 Front View Distillation Apparatus** | |
| **K45200** | Right-Hand Model, 115V 60Hz |
| **K45300** | Left-Hand Model, 115V 60Hz |
| **K45290** | Right-Hand Model, 220-240V 50/60Hz |
| **K45390** | Left-Hand Model, 220-240V 50/60Hz |

### ASTM Distillation Thermometers

| Catalog No. | Thermometer | Range |
|---|---|---|
| **250-000-02C** | ASTM 2C Partial Immersion | –5 to +300°C |
| **250-000-07F** | ASTM 7F Low Distillation | 30 to 580°F |
| **250-000-07C** | ASTM 7C Low Distillation | –2 to +300°C |
| **250-000-08F** | ASTM 8F High Distillation | 30 to 760°F |
| **250-000-08C** | ASTM 8C High Distillation | –2 to +400°C |
| **250-000-37C** | ASTM 37C Solvents Distillation | –2 to +52°C |
| **250-000-38C** | ASTM 38C Solvents Distillation | 24 to 78°C |
| **250-000-39C** | ASTM 39C Solvents Distillation | 48 to 102°C |
| **250-000-40C** | ASTM 40C Solvents Distillation | 72 to 126°C |
| **250-000-41C** | ASTM 41C Solvents Distillation | 98 to 152°C |
| **250-000-42C** | ASTM 42C Solvents Distillation | 95 to 255°C |
| **250-000-102C** | ASTM 102C Solvents Distillation | 123 to 177°C |
| **250-000-103C** | ASTM 103C Solvents Distillation | 148 to 202°C |
| **250-000-104C** | ASTM 104C Solvents Distillation | 173 to 227°C |
| **250-000-105C** | ASTM 105C Solvents Distillation | 198 to 252°C |
| **250-000-106C** | ASTM 106C Solvents Distillation | 223 to 277°C |
| **250-000-107C** | ASTM 107C Solvents Distillation | 248 to 302°C |

### Accessories

| Catalog No. | Type | Capacity, mL |
|---|---|---|
| **Flasks** | | |
| **332-003-006** | A | 100 |
| **332-003-001** | B | 125 |
| **332-003-002** | C | 200 |
| **332-003-005** | D | 250 |
| **Graduates** | | |
| **332-002-013** | A | 25 |
| **332-002-003** | B | 100 |
| **332-002-014** | C | 200 |
| **Flask Support Boards** | | |
| **K45410** | A | 1¼" (3.18) |
| **K45420** | B | 1½"(3.81) |
| **K45430** | C | 2" (5.1) |
| **K45440** | D | 2¾"(6.98) |
| **Miscellaneous** | | |
| **K45540** | Receiver Cooling Bath Jar | |
| **334-002-001** | Top Silicone Plug, For Type A, B, & D Flasks | pk/10 |
| **334-002-002** | Side Silicone Plug | pk/10 |
| **334-002-003** | Top Silicone Plug, For Type C Flask | pk/10 |

***For NIST traceable certified thermometers, please refer to the ASTM Thermometer section on pages 184 through 191.***

Koehler INSTRUMENT COMPANY, INC.

# Automatic Distillation of Petroleum Products

*K45603 Automatic Distillation Analyzer with Optional External PC*

## Specifications

Conforms to the specifications of:
ASTM D86, D285, D850, D1078, D4737; D189 Section 10; DIN 51751; ISO 3405; IP 123; IP 195; JIS K2254l; NF M 07-002

Electrical Requirements: CE
120V 60Hz 20A
230V 50/60Hz 10A

Temperature

| | |
|---|---|
| Distillation Range: | 0 to 450°C (±0.1°C accuracy) |
| Condenser: | -5 to 60°C (±0.1°C accuracy); closed loop system |
| Receiver Chamber: | 0 to 60°C (±0.1°C accuracy) |

Distillation Parameters:

| | |
|---|---|
| Distillation Rate: | 2 to 15mL/min in 0.1mL increments, user selectable |
| Receiver Volume: | 0 to 100mL (±0.01mL accuracy) by photoelectric infrared detection of meniscus by level following system utilizing a precision stepper motor and a special calibrated glass receiver; automatic calibration of evaporated loss volume and automatic volume calibration system ensures highest accuracy |
| Barometic Pressure: | Automatic barometric correction utility with automatic sensor, range 550 to 900 mm Hg (±1 mm Hg accuracy) |
| Dry Point Detection: | Automatic dry point detection board is included with standard equipment and only requires a dry point sensor, 200mL flask and PTFE plug for ASTM D850 and D1078 tests. |
| Environment: | Operates at 0 to 25°C (113°F) |

**Dimensions** lxwxh,in.(cm)
21x21.5x27.75 (53.3x54.6x70.5)
Net Weight: 230 lbs (91kg)

**Shipping Information**
Shipping Weight: 260 lbs (95 kg)
Dimensions: 28 Cu. ft.

## Test Method

**The sample is evaporated and condensed under controlled conditions, and observations are made of the temperatures at which various percentages are recovered and/or the percentages recovered at specific temperatures.**

## Automatic Distillation Analyzer 5000 Series

- Conforms to ASTM D86, D285, D4737 and related international specifications
- Pt-100 RTD probe with **automatic temperature calibration system** (°C or °F)
- Windows®-based software package for PC control with LIMS export capabilities
- Automatic determination of initial boiling point (IBP), final boiling point (FPB), dry point and barometric and residue corrections
- Diagnostic system continuously ensures proper unit performance and user safety
- Automatic temperature and volume calibration
- Programmable distillation rate (2-15mL/min)
- Ready for distillation groups 1 - 4
- Networking for up to 32 units
- Powerful CFC-free cooling and heating system
- Receiver chamber heating system up to 60°C
- Precision level follower system with optical meniscus detector
- Integrated automatic fire extinguishing system with manual operation override

The Koehler Automatic Distillation Analyzer is designed to perform optimal distillation analyses of gasolines, fuels, oils, solvents, aromatics, napthas, kerosenes, hydrocarbons, and other volatile products to ensure conformity to rigid quality control standards. The analyzer automatically performs tests, processes results, and produces standard reports according to ASTM, ISO, and related specifications.

**Two Models are Available**-The Automatic Distillation Analyzer 5000 Series may be ordered for operation with an external PC (purchased separately) or may be ordered with a built-in PC, internal touch screen monitor, virtual keyboard and mouse. An easy-to-use Windows®-based PC communication software expands user capabilities for data analysis and unit control. Distillation methods and parameters can be easily created or modified. Software calculates repeatability and reproducibility as per ASTM D86 as well as standard and deviation against reference materials. Test results are displayed in real-time and can include distillation curve and temperature with or without barometric compensation and/or evaporation correction, distillation rate, heating power curve, master curve comparison, and zoom function for high resolution of heating and temperature curves. The heater compartment is rapidly cooled at the completion of a distillation run to reduce operator downtime. The analyzers are of rugged construction for instrument longevity with a modular design for easy routine maintenance.

**Receiver Chamber Heating System**-The receiver chamber heating system is ideal for samples that form waxes or other solids during distillation.

# Automatic Distillation of Petroleum Products

**Dry Point Detection as Standard Feature**- Dry point can be detected visually or by automatic detection for ASTM D850 and D1078 test methods. The unit is delivered ready with the PC board components already included as standard to perform the dry point analysis. Simply order the Automatic Dry Point Detection Kit for Solvents (see Ordering Information at right) which includes dry point thermocouple, 200mL flask and PTFE plug to perform dry point detection analysis automatically.

**Ready for Groups 1 - 4 and more**-Each Koehler Automatic Distillation Analyzer 5000 Series comes ready with the equipment, accessories and features as standard to properly run distillation groups 1 to 4 per ASTM D86 and related test specifications. No additional accessories are required. The Windows®-based software package allows simple operator selection of the programmed settings for each distillation protocol. No complicated routines are needed to set up the unit. User defined programs are easily created for customization of the analyzer.

**Calculated Cetane Index**-Calculated cetane index is a useful tool for estimating ASTM D4737 cetane number where a test engine is not available for determining this properly. It may be conveniently employed for approximating cetane number where the quantity of sample is too small for an engine rating. In cases where the cetane number of a fuel has been initially established, the index is useful as a cetane number check on subsequent samples of that fuel, provided its source and mode of manufacture remain unchanged. The Cetane index is automatically calculated at the end of the test if all the necessary variables are entered and is a component of the Windows®-based software which comes standard with the unit.

**Carbon Residue on 10% Distillation Residue**-As per section 10, ASTM D189 the procedure for carbon residue of light distillate oils can be performed.

### Included Accessories

Distillation Flask, 125mL with Markings
Ceran Plate, 25mm dia. hole
Ceran Plate, 38mm dia. hole
Ceran Plate, 50mm dia. hole
3 Point Calibrated PT100 Thermometer with Cable and Plug
Special Graduated Receiver Cylinder with Base
Wiper for Condenser Tube
Dropping Plate
Teflon Plug for 125mL Flask
Silicone Plug for Flask Side Arm
Dry Point Detection Board
Windows®-based Automatic Distillation Software

*K45703-TS Automatic Distillation Analyzer with Touch Screen Display and Integrated PC*

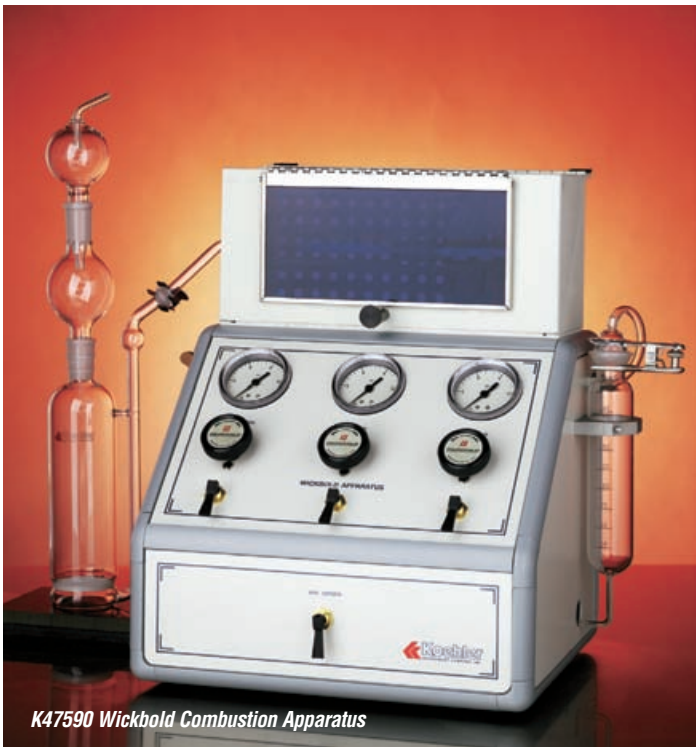
## Ordering Information

### Automatic Distillation Analyzer 5000 Series

| Catalog No. | |
|---|---|
| **K45603** | Automatic Distillation Analyzer, 120V 60Hz |
| **K45604** | Automatic Distillation Analyzer, 230V 50/60Hz |
| **K45703-TS** | Automatic Distillation Analyzer with Touch Screen Display and Integrated PC, 120V 60Hz |
| **K45704-TS** | Automatic Distillation Analyzer with Touch Screen Display and Integrated PC, 230V 50/60Hz |

### Accessories

| | |
|---|---|
| **K45634** | Distillation Flask, 125mL with Markings |
| **K45635** | PTFE Centering Stopper for 125mL Flask |
| **K45655** | Ceran Plate, 32mm dia. hole |
| **K45656** | Ceran Plate, 38mm dia. hole |
| **K45657** | Ceran Plate, 50mm dia. hole |
| **K45656-A** | Ceran Plate, 25mm dia. hole |
| **K45650** | PT100 Thermometer with Cable and Plug |
| **K45651-E** | Special Graduated Receiver Cylinder (with base) |
| **K45651-B** | Special Graduated Receiver Cylinder (without base) |
| **K45601-03014** | Condenser Tube Cleaning Assembly |
| **K45668** | Dropping Plate |
| **K45654-A** | Flask 200mL with Silicon Plug |
| **K45652-C** | Silicone Plug |
| **K45654** | Automatic Dry Point Detection Kit for D850 and D1078 |


*K47590 Wickbold Combustion Apparatus*

## Specifications
Conforms to the specifications of:
ASTM D2384, D2747 (Withdrawn 1985), D2784, D2785 (Withdrawn 1987); GPA 2140; IP 243; ISO 4260; DIN EN 41; NF T 60-142
Electrical Requirements: CE
115V 60Hz
220-240V 50/60Hz

## Included Accessories
Complete Glassware Set
Sample Capillary
Sample Reservoir
Combustion Chamber
Absorber
Spray Trap
Cooling Bulb
Stainless Steel Burner

**Dimensions** lxwxh,in.(cm)
Cabinet only: 15x13x18½(38x33x47)
Net Weight: 40 lbs (18.1kg)

## Shipping Information
Shipping Weight: 62 lbs (28.1kg)
Dimensions: 11.9 Cu. ft.

## Sulfur in Liquefied Petroleum Gases (Oxy-Hydrogen Burner)
## Traces of Volatile Chlorides in Butane-Butene Mixtures
## Trace Quantities of Total Sulfur (Wickbold Apparatus)
## Sulfur in Petroleum Products (Wickbold Apparatus)

## Test Method
Determines total sulfur in liquefied petroleum (LP) gases and in liquid petroleum products by the Wickbold oxy-hydrogen burner method. Also suitable for burning butane-butene mixtures to determine trace amounts of volatile chlorides.

## Wickbold Combustion Apparatus
- Conforms to ASTM D2384, D2784 and related specifications

Burns samples in a stainless steel oxy-hydrogen burner to determine total sulfur in petroleum products in the 0.1 to 300ppm range. Tests samples which are viscous, highly aromatic or of high sulfur content with the use of appropriate solvents.

Combustion chamber and stainless steel burner are housed in an insulated chamber with hinged heat-resistant and glare-proof shield for viewing burner flame. To ignite flame, depress electronic spark ignitor handle at side of unit. Ignitor shuts off when handle is released. Built-in pressure regulators with gauges allow for accurate adjustment and monitoring of hydrogen, oxygen and nitrogen pressure. Burner is easily disassembled for cleaning.

Supplied with a complete set of Borosilicate Glass and quartz glassware, including 200mL sample reservoir, sample capillary, combustion chamber, absorber, spray trap and cooling bulb, and compression-type gas connection fittings for ¼" (6mm) O.D. tubing. Housed in a finished aluminum cabinet. For LPG, natural gas and refinery gas samples, order accessory sample adapter.

**Ordering Information**

| Catalog No. | | Order Qty |
|---|---|---|
| **K47500** | Wickbold Apparatus, 115V 60Hz | 1 |
| **K47590** | Wickbold Apparatus, 220-240V 50/60Hz | |
| | **Accessories** | |
| **K47580** | Gas Sample Adapter<br>For burning liquefied petroleum, natural and refinery gases in the Wickbold Apparatus. Constructed entirely of stainless steel, with 150mL sample cylinder, connecting tubing and all necessary valves and couplings | 1 |
| **K47510** | Sample Capillary | |
| **K47520** | Sample Reservoir | |
| **K47530** | Combustion Chamber | |
| **K47540** | Absorber | |
| **K47550** | Spray Trap | |
| **K47560** | Cooling Bulb | |
| **K47570** | Stainless Steel Burner | |

# Ramsbottom Carbon Residue of Petroleum Products

## Test Method

**Determines the 'carbon residue' left after evaporation and pyrolysis of a sample oil in the Ramsbottom furnace, providing an indication of the deposit forming tendencies of fuels and guidelines for the processing of refinery products.**

## Ramsbottom Carbon Residue Apparatus

- Conforms to ASTM D524 and related specifications
- Microprocessor temperature control with digital display and overtemperature cut-off

Thermostatically controlled coking furnace for five samples. Cast-iron block type furnace reaches the standard test temperature of 550°C (1022°F) rapidly and controls with ±1°C stability. Microprocessor temperature control has °C/°F switchable digital setpoint and display. Operator and equipment are protected by an overtemperature control circuit which automatically interrupts power to the unit should block temperature exceed the programmed cut-off point. *Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Contact your Koehler representative for information.* Heavily insulated stainless steel cabinet with three-layer refractory top provides excellent heat retention.

### Ordering Information

| Catalog No. | | Order Qty |
|---|---|---|
| **K27100** | Ramsbottom Carbon Residue Apparatus, 115V 60Hz | 1 |
| **K27190** | Ramsbottom Carbon Residue Apparatus, 220-240V 50/60Hz | |
| | **Accessories** | |
| **332-007-001** | Coking Bulb<br>Borosilicate Glass, with capillary<br>Conforms to ASTM D524 specifications | 5 |
| **362-010-001** | Sample Charging Syringe | 1 |
| **382-018-001** | Needle, 18 gauge, 2" | 1 |
| **K27320** | Coking Bulb Filling Device<br>Convenient time saving device fills up to five coking bulbs at a time. Ideal for viscous fluids that are difficult to handle at room temperature. | 1 |
| **K27200** | Control Bulb<br>Stainless steel, with IC thermocouple.<br>May be used with a thermocouple pyrometer* to verify compliance of the furnace with ASTM performance requirements. | 1 |
| **K29310** | Digital Thermometer, 115V | |
| **K29319** | Digital Thermometer, 220-240V<br>**The K29310 Digital Thermometer is suitable for this purpose.* | |

*K27100 Ramsbottom Carbon Residue Apparatus*

## Specifications

Conforms to the specifications of:
ASTM D524, D6074; IP 14; ISO 4262; FTM 791-5002; NF T 60-117
Furnace Type: Cast iron block
Capacity: 5 coking bulbs
Maximum Temperature: 650°C (1200°F)
Controller Sensitivity: ±1°C (± 2°F)
Heater: 0-2400W, ceramic band heater
Electrical Requirements: CE
115V 60Hz, Single Phase, 20.8A
220-240V 50/60Hz, Single Phase, 10.9A

## Dimensions lxwxh,in.(cm)

16x21½x14½(41x55x37)
Net Weight: 64 lbs (29kg)

## Shipping Information

Shipping Weight: 78 lbs (35kg)
Dimensions: 8.2 Cu. ft.

***Software compatible, inquire with Koehler Customer Service.***

Koehler INSTRUMENT COMPANY, INC.

# Lead in Gasoline, Acidity, Salt Content

*K46600*
*Dual Extraction Apparatus*

## Lead in Gasoline by Volumetric Chromate Method

## Acidity (Inorganic) of Petroleum Products by Color Indicator Titration Method

## Salt Content of Crude Petroleum and Products

### Test Method

**Determines lead, acid or salt content of crude petroleum and products by extraction.**

### Dual Extraction Apparatus

• Conforms to ASTM D2547, IP 77, 182, 248 and ISO 2083 specifications

Consists of two sets of glassware mounted on a sturdy base/upright assembly with separate line switches, rheostats and condenser water control valves for each. Each glassware set includes 500mL boiling flask with heating tube, Hopkins reflux condenser with aspirator, thistle tube, 250W heating coil and 400mL Borosilicate Glass beaker.

### Specifications

Conforms to the specifications of:
ASTM D2547 (Withdrawn 1989);
IP 77, 182, 248; ISO 2083;
NF M 07-014, 07-023
Electrical Requirements: CE
115V 60Hz
220-240V 50/60Hz

### Dimensions lxwxh,in.(cm)

17x11x36½ (43x28x93)
Net Weight: 46 lbs (21kg)

### Shipping Information

Shipping Weight: 66 lbs (30kg)

**Ordering Information**

| Catalog No. | | Order Qty |
|---|---|---|
| **K46600** | Dual Extraction Apparatus, 115V 60Hz | 1 |
| **K46690** | Dual Extraction Apparatus, 220-240V 50/60Hz | |

# Conradson Carbon Residue of Petroleum Products

### Test Method

**Provides an indication of relative coke forming properties of petroleum oils. The residue remaining after a specified period of evaporation and pyrolysis is calculated as a percentage of the original sample.**

### Conradson Carbon Residue Apparatus

• Conforms to ASTM D189 specifications

A weighed quantity of sample is placed in a crucible and heated to a high temperature for a fixed period. The crucible and the carbonaceous residue is cooled in a desiccator and weighed. The residue remaining is calculated as a percentage of the original sample and reported as conradson carbon residue.

**Ordering Information**

| Catalog No. | | Order Qty |
|---|---|---|
| **K80030** | Conradson Carbon Residue Apparatus | 1 |
| | **Accessories** | |
| **K80031** | Porcelain Crucible | |
| **K80032** | Skidmore Crucible, with Iron Cover | |
| **K80033** | Iron Crucible, with cover | |
| **K80034** | Iron Hood, with bridge | |
| **K80034-WT** | Nickel-Chrome Triangle Wire Support | |
| **K80035** | Refractory Block | |
| **K80036** | Tripod | |
| **K80039** | Burner | |

*For NIST traceable certified thermometers, please refer to the ASTM Thermometer section on pages 184 through 191.*

*K80030*
*Conradson Carbon Residue Apparatus*

### Specifications

Conforms to the specifications of:
ASTM D189, D6074; ANS Z-11.25;
IP 13; ISO 6615; DIN 51551;
FTM 791-5001; NF T 60-116

### Shipping Information

Shipping Weight: 7 lbs (3.2kg)

### Included Accessories

Porcelain Crucible
Skidmore Crucible, with Iron Cover
Iron Crucible, with Cover
Iron Hood, with Bridge
Refractory Block
Nickel-Chrome Triangle Wire Support
Tripod
Burner

# Sediment in Crude Oils and Fuel Oils by the Extraction Method

## Test Method

**Determines sediment content of crude oil and fuel oils by extraction with toluene.**

## Sediment Extraction Apparatus

- Conforms to ASTM D473 and related specifications

A test portion of the sample is placed in a refractory thimble. Toluene is gently boiled and its vapors condensed and allowed to drip into the sample funnel. The toluene washes out all of the crude oil or fuel oil leaving the insoluble residue only in the thimble. The mass of the residue is calculated as a percentage and is referred to as the sediment by extraction. Includes condenser thimble basket, water cup and extraction thimble.

**Ordering Information**

| Catalog No. | | Order Qty |
|---|---|---|
| K48300 | Sediment Extraction Apparatus | 1 |
| | **Accessories** | |
| K42000 | Powertrol Heater, 115V 60Hz | 1 |
| K42090 | Powertrol Heater, 220-240V 50/60Hz | |
| K48400 | Condenser | |
| K48500 | Thimble Basket | |
| K48600 | Water Cup | |
| K48700 | Extraction Thimble | |

*K48300 Sediment Extraction Apparatus*

## Specifications

Conforms to the specifications of:
ASTM D473; IP 53; ISO 3735; DIN 51789; FTM 791-3002; NF M 07-010

# Salts in Crude Analyzer

## Test Method

**Salt content is determined by measuring the conductivity of a solution of crude oil in a polar solvent when subjected to an alternating electrical current and is obtained by comparison of the resulting conductance to a calibration curve of known salt mixtures.**

## Electrometric Salt Determinator

- Conforms to ASTM D3230 and IP 265 test specifications
- GOST certified
- Measures salt content, conductance, and temperature of crude oil samples, and pH measurements of aqueous samples
- Measures Salts Concentration in the range of 0 to 150 PTB (lb/1000 bbl)
- Portable for field or laboratory testing with up to 8 hours of continuous operation from internal Ni-Cd rechargeable batteries
- 18-bit analog-to-digital converter for high precision
- 24Kb RAM dedicated for data storage (about 500 test results)
- Data can be uploaded in a comma delimited format to a PC with easy to use Windows® 2000/XP/Vista – based software via an RS232 serial data port

Determines the salt content, conductance, and temperature of crude oil samples according to ASTM D3230 and IP 265 specifications. Utilizes the latest low-voltage, synchronous detection technology for conductivity measurements and a high-accuracy thermistor array to measure sample temperature. Automatically calculates salt concentration directly from acquired temperature and conductivity values. Measures conductivity over four ranges 0-2, 2-20, 20-200, and 200-1500 mS with automatic range selection. Self-calibration feature allows operator to adjust for any drift without re-entering standard temperature curves. Complete data storage of test results which is limited only by the hard drive capacity of external PC. Easy-to-read alpha-numeric display shows any four of the following parameters at one time as chosen by the operator: salts, conductance, conductance @ 25°C, pH, pH millivolts, temperature (°C or °F), internal and external battery voltages, date, time, logging ID, and ID increment value.

*K23050*
*Salt in Crude Analyzer*

## Electrical Requirements CE

115V 60Hz
220-240V 50/60Hz

## Shipping Information

Shipping Weight: 6 lbs (2.75kg)
Dimensions: 1.5 Cu. ft.

**Dimensions** lxwxh,in.(cm)
9x4.25x2.5 (23x10.8x6.5)
Net Weight: 2 lbs (1kg)

**Ordering Information**

| Catalog No. | | |
|---|---|---|
| K23050 | Salt in Crude Analyzer, 115/230V 50/60Hz | |
| | **Accessories** | |
| K23050-9 | Mixed Salts Solution, 100ml | |
| K23050-10 | Mixed Salts Solution, 500ml | |

Koehler INSTRUMENT COMPANY, INC.

# Water and Sediment Determination by Automatic Centrifuge

## Test Method

**Centrifugation provides a convenient means of determining sediment and water content in crude oil, fuel oils, middle distillate fuels, and biodiesel. Also used in determining the precipitation number, demulsibility characteristics, trace sediments, and insolubles in used lubricating oils.**

## Automatic Heated Oil Test Centrifuge

- Choice of long, short, pear, or finger rotor assembly to accommodate corresponding centrifuge tubes
- Accommodates four (4) centrifuge tubes of 6 or 8" conical ASTM types, long, short, pear or finger tubes
- Automatic control of acceleration ramp, centrifugation speed, and timing functions.
- 4½" LCD Touch Screen Control Panel
- Substantial Insulation for Reduced Heat Loss
- Precise balancing, Quiet Operation
- Large, clear, top opening lid
- Class 1, Division 2 explosion resistant rating

Fully automatic bench top centrifuge designed expressly for petroleum testing applications. Features a 4½" LCD touch screen control panel. This integrated touch screen can be used to turn the heat on and off, set the duration of the test, set the RCF/RPM values and choose the type of rotor assembly and corresponding glassware to be used during the test. The motor speed mechanism allows the user to simply set the desired speed and the instrument will attain that speed. This mechanism calculates RPM based on the given RCF and type of Rotor selected. The large, clear, top opening lid provides for easy access to the rotor and tube holders and for cleaning of the unit. The lid has a 18½" diameter viewing window allowing the operator to view inside the chamber for checking the status of the rotor and checking for possible spillage of the centrifuge tubes. Molded PTFE cushions provide for maximum protection and easy positioning of the tubes.

### Safety Features

The Centrifuge comes equipped with a Safety Lockout Mechanism. Upon emergency shutdown the door is locked and cannot be unlocked until the unit comes to a complete stop, the unit is turned back on, and the stop/unlock key is pressed on the touch screen display. Furthermore, the centrifuge cannot start while the door of the chamber is open and the latch is not engaged. The "Nitrogen Purge" feature allows for a slow release of Nitrogen into the bowl of the centrifuge. This feature requires an external Nitrogen Gas source and can easily connect to an Inlet port located at the back of the unit

### Specifications

Conforms to the specifications of:
ASTM D91, D96, D893, D1796, D1966 , D2273, D2709, D2711, D4007, D5546; IP 75, 145, 359; API MPMS Chapter 10.4, API 2542, 2548; ISO 3734; DIN 51793; NF M 07-020
Capacity: Four (4) oil test centrifuge tubes: long (100mL), short (100mL), pear (100mL), or finger tubes (12.5mL)
Maximum Speed: 2200 RPM
Maximum RCF: 1327 (long); 1170 (short); 865 (pear-shaped)
Timer: 0 to 999 min
Set Speed: 200 - 2200 RPM
Speed Readout: 0 - 2200 RPM
Temperature Control: ambient to 93°C (200°F)
Temperature Readout: Digital
Brake: Automatic Dynamic

### Electrical Requirements CE

115V 60Hz, 10A — 230V 50/60Hz, 5A

### Dimensions lxwxh,in.(cm)

23x30x13½ (51x76x34) — Net Weight: 93 lbs (42 kg)

### Shipping Information

Shipping Weight: 110 lbs (50 kg) — Dimensions: 11.2 Cu. ft.

*K60002 Automatic Heated Oil Test Centrifuge*

### Ordering Information

| Catalog No. | |
|---|---|
| K60002 | Automatic Heated Oil Test Centrifuge, 115V 60Hz with Long Tube Rotor Assembly |
| K60092 | Automatic Heated Oil Test Centrifuge, 230V 50/60Hz with Long Tube (RA*) |
| K60002-ST | Automatic Heated Oil Test Centrifuge, 115V 60Hz, Short Tube (RA*) |
| K60092-ST | Automatic Heated Oil Test Centrifuge, 230V 50/60Hz with Short Tube (RA*) |
| K60002-PT | Automatic Heated Oil Test Centrifuge, 115V 60Hz , Pear Tube (RA*) |
| K60092-PT | Automatic Heated Oil Test Centrifuge, 230V 50/60Hz with Pear Tube (RA*) |
| K60002-FT | Automatic Heated Oil Test Centrifuge, 115V 60Hz , Finger Tube (RA*) |
| K60092-FT | Automatic Heated Oil Test Centrifuge, 230V 50/60Hz with Finger Tube (RA*) |

*Rotor Assembly

#### Accessories

| | |
|---|---|
| K60002-LT-1 | Rotor Assembly for Long Tubes |
| K61101 | Centrifuge Tube, Long, 100mL, 8", marked in mL (ASTM D91, D96, D893, D1796, D4007) |
| K61106 | Centrifuge Tube, Long, 100mL, 8", marked in 200 parts (ASTM D96) |
| K61110 | Centrifuge Tube, Long, 100mL, 8", marked in mL every 1mL above 10mi (ASTM D96, D4007) |
| K61112 | Centrifuge Tube, Long, 100mL, 8", marked in 200 parts every 2 parts above 20 parts (ASTM D96) |
| K61109 | Centrifuge Tube, Cone-Shaped, 100mL with capillary tip capable of measuring 0.01 mL and readable by estimation to 0.005% (ASTM D2273, D2709) (K61153 cushion required for each tube) |
| K61153 | PTFE cushion for Long Tubes w/capillary tip (Req. for K61109 tubes) |
| K60002-ST-1 | Rotor Assembly for Short Tubes |
| K61102 | Centrifuge Tube, Short, 100mL, 6", marked in 200 parts every 4 parts above 20mL (ASTM D96) |
| K61105 | Centrifuge Tube, Short, 100mL, 6", marked in mL (ASTM D96) |
| K61107 | Centrifuge Tube, Short, 100mL, 6", marked in mL every 2mL above 10mL (ASTM D96) |
| K61108 | Centrifuge Tube, Short, 100mL, 6", marked in 200 parts (ASTM D96) |
| K60002-PT-1 | Rotor Assembly for Pear Tubes |
| K61104 | Centrifuge Tube, Pear, 100mL, marked in mL (ASTM D1966) |
| K61152 | Centrifuge Tube, Pear, 100mL, with tube tip having graduations of 0.01mL over the range 0 to 0.2mL (ASTM D2709) |
| K61111 | Cork Stopper for Centrifuge Tubes |
| K60002-FT-1 | Rotor Assembly for Finger Tubes |
| K61141 | Centrifuge Tube, Finger Tube (API 2542) |

# Water and Sediment Determination in Crude Oil by Centrifuge

## Test Method

**For the determination of water and sediment of crude oil by centrifuge method during field custody transfers. This test method is considered the most practical method for field determination of sediment and water.**

## Portable Oil Test Centrifuge

- Two Models Available: Two (2) place 12VDC & Four (4) place 115/230VAC
- Accommodates either two 6" conical centrifuge short tubes or four short cone / finger centrifuge tubes, model dependent
- Integrated Tube Holder / Pre-heater / Timer. Model Dependent
- Switchable Temperature Display between °C and °F
- Opening in Top Lid for Speed Calibration by Portable Laser Tachometer

### Specifications

Conforms to the specifications of: ASTM D96; API MPMS Chapter 10.4, API 2542
Test Capacity: K60094: Two (2) short cone centrifuge tubes
K600X5/K600X6: Four (4) short cone or finger centrifuge tubes
Speed Range: 300 – 1800 RPM RCF Range: 20 - 700
Temperature Control: Ambient to 160°F (71.1°C)
Electrical Requirements: 12V DC 40, 115VAC 60HZ , 220-240VAC 50/60Hz CE

### Ordering Information

**Catalog No.**

**Accessories**

| | |
|---|---|
| **K61102** | Centrifuge Tube, Short, 100mL, 6", marked in 200 parts every 4 parts above 20mL |
| **K61105** | Centrifuge Tube, Short, 100mL, 6", marked in mL |
| **K61107** | Centrifuge Tube, Short, 100mL, 6", marked in mL every 2mL above 10mL |
| **K61108** | Centrifuge Tube, Short, 100ml, 6", marked in 200 parts |
| **K61141** | Centrifuge Tube, Finger Tube, 12.5mL |
| **K61111** | Cork Stopper |

***K60094***
***Portable Heated Oil Test Centrifuge***

### Ordering Information

**Catalog No.**

| | |
|---|---|
| **K60094** | Portable Heated Oil Test Centrifuge, 12V DC 40A |
| **K60005** | Heated Oil Test Centrifuge, 4-Place, 115V 60Hz |
| **K60095** | Heated Oil Test Centrifuge, 4-Place, 220-240V 50/60Hz |
| **K60005-FT** | Heated Oil Test Centrifuge, 4-Place, Finger Tube RA, 115V 60Hz |
| **K60095-FT** | Heated Oil Test Centrifuge, 4-Place, Finger Tube RA, 220-240V 50/60Hz |
| **K60005-FT8** | Heated Oil Test Centrifuge, 8-Place, Finger Tube RA, 115V 60Hz |
| **K60095-FT8** | Heated Oil Test Centrifuge, 8-Place, Finger Tube RA, 220-240V 50/60Hz |
| **K60006** | Heated Oil Test Centrifuge, 4-Place, w/Timer, 115V 60Hz |
| **K60096** | Heated Oil Test Centrifuge, 4-Place, w/Timer, 220-240V 50/60Hz |
| **K60006-FT** | Heated Oil Test Centrifuge, 4-Place, Finger Tube, w/Timer, 115V 60Hz |
| **K60096-FT** | Heated Oil Test Centrifuge, 4-Place, Finger Tube, w/Timer, 220-240V 50/60Hz |

# Ash from Petroleum Products

## Test Method

**Determines the amount of ash in distillate and residual fuels, gas turbine fuels, crude oils, lubricating oils, waxes, and other petroleum products.**

## Programmable Ashing Furnace

- Six Complete Air Exchanges per Minute
- Incoming air preheated for enhanced temperature uniformity
- Digital PID Temperature Control
- Integrated Timer
- Store up to 9 different programs
- Maximum Temperature of 1100°C

### Specifications

Conforms to the Specifications of: ASTM D482, D874, D3174, D4422, D5184; IP4, IP163, ISO 3987, ISO 6245; NF M 07-045; DIN 51352, DIN 51575
Temperature Range: Ambient - 1100°C Temperature Accuracy: ± 3°C

Oven Volume:
- 0.07 cu. ft. model: 3 L
- 0.16 cu. ft. model: 5 L
- 0.33 cu. ft. model: 9 L
- 0.47 cu. ft. model: 15 L

Power:
- 0.07 cu. ft. model: 1.2 kW
- 0.16 cu. ft. model: 2.4 kW
- 0.33 cu. ft. model: 3.0 kW
- 0.47 cu. ft. model: 3.6 kW

### Ordering Information

**Catalog No.**

| | |
|---|---|
| **K24305** | Programmable Ashing Furnace, 0.07 cu.ft. 208V 50/60Hz |
| **K24306** | Programmable Ashing Furnace, 0.16 cu.ft. 208V 50/60Hz |
| **K24307** | Programmable Ashing Furnace, 0.33 cu.ft. 208V 50/60Hz |
| **K24308** | Programmable Ashing Furnace, 0.47 cu.ft. 208V 50/60Hz |
| **K24395** | Programmable Ashing Furnace, 0.07 cu.ft. 240V 50/60Hz |
| **K24396** | Programmable Ashing Furnace, 0.16 cu.ft. 240V 50/60Hz |
| **K24397** | Programmable Ashing Furnace, 0.33 cu.ft. 240V 50/60Hz |
| **K24398** | Programmable Ashing Furnace, 0.47 cu.ft. 240V 50/60Hz |

***K24308***
***Programmable Ashing Furnace***

Electrical Requirements: CE
208V, 50/60Hz, Single Phase 240V, 50/60Hz, Single Phase

**Dimensions** wxdxh,in.(cm) Net Weight: lbs (kg)
0.07 cu. ft. model: 14.96x14.57x29.53 (38x37x75) Net Weight: 44.1 (20)
0.16 cu. ft. model: 17.33x18.50x33.46 (44x47x85) Net Weight: 77.2 (35)
0.33 cu. ft. model: 18.90x21.66x35.44 (48x55x90) Net Weight: 99.3 (45)
0.47 cu. ft. model: 18.90x25.59x35.44 (48x65x90) Net Weight: 121.3 (55)

Koehler INSTRUMENT COMPANY, INC.

# Automatic Density Meter

## Test Method

**Density is a fundamental physical property that can be used in conjunction with other properties to characterize the quality of crude oils, light and heavy fractions of petroleum and petroleum products. The test method covers the determination of the density or relative density of crude oils, petroleum distillates and viscous oils that can be handled in a normal fashion as liquids at test temperatures between 15 and 35°C.**

## Specifications

Conforms to the specifications of:
ASTM D1250, D4052, D5002, D5931; DIN 51757
Measurement Ranges:
Density: 0 to 3 g/cm3
Temperature: 0°C to 90°C
Pressure: 0 to 10 bars
Measurement Modes: Continuous, Single, Multiple
Accuracy:
K86200: Density: 0.00005 g/cm3
Temperature: 0.03°C
K86201: Density: 0.0001 g/cm3
Temperature: 0.05°C
Repeatability:
K86200: Density: 0.00001 g/cm3
Temperature: 0.01°C
K86201: Density: 0.00005 g/cm3
Temperature: 0.02°C
Resolution: Density: 0.00001 g/cm3
Temperature: 0.01°C
Minimum Sample Volume: 1 ml, approximately
Wetted Materials: Borosilicate glass, Teflon (PTFE, ECTFE)
Display: 10.4 inch diagonal, 800-600 pixels, color, Flat Panel Monitor with Resistant Touch Screen Interface, 200 bit brightness, gasketted for spill protection.
Communication Interface:
K86200: Touch Screen User Interface
3 – USB Ports
2 – RS232 Ports
Ethernet Port for Network Connection
Keyboard, Bar Code Scanner,
Mouse, Network Capabilities
K86201: Touch Screen User Interface
3 – USB Ports
1 – Cat. 5 Port
2 – RS232 Ports
Keyboard, Bar Code Scanner,
Mouse, Network Capabilities
Video and Magnification: Video assisted view of cell, capable of approximately 10X magnification
Internal Memory: 2 GB Non-removable Compact Flash
Electrical Requirements: CE
85 to 260 VAC; 48 to 62 Hz
150- 200 Watts

## Included Accessories

Quick Start Guide
Desiccant
Filling Nozzles
NIST Standards
IQ/OQ/PQ Documentation
Luer Syringes
Connecting Fittings & Tubing
Manual

***K86200 Automatic Density Meter***

## Dimensions lxwxh,in.(cm)

91.44cm (L) x 48.26 cm (W) x 45.72 cm (H)

## Shipping Information

Shipping Weight: 70 lbs. (31.75 kg)

### Ordering Information

| Catalog No. | | Order Qty |
|---|---|---|
| **K86200** | Automatic Density Meter, Model A | 1 |
| **K86201** | Automatic Density Meter, Model B | 1 |

### Accessories

| | |
|---|---|
| **K86202** | 21 CFR Part 11 Option |
| **K86203** | Refractometer Control Module |
| **K86204** | Heated Interface Attachment |
| **K86206** | Bar Code Scanner - USB |
| **K86207** | Fluke Hart Thermometer Kit<br>Consists of Handheld Digital Thermometer, Temperature Probe, and Calibration Certificate |
| **K86208** | Inkjet USB Printer Kit<br>Includes Inkjet Printer and USB communication cable |
| **K86209** | Laser USB Printer Kit<br>Includes Laser printer and USB communication cable |
| **K86210** | 40 Column Serial Printer Kit<br>Includes 40 Column Serial (RS232) Printer, Null Modern Cable, and Adapter |

# Rust Protection by Metal Preservatives in the Humidity Cabinet

## Test Method

**Tests the ability of metal preservatives to prevent steel panels from rusting under conditions of high humidity. Polished steel panels are immersed in the sample oil and then suspended in the humidity cabinet for a specified test period.**

## Humidity Cabinet

- Conforms to ASTM D1748 and FTM 791-5310 specifications

Produces a moisture saturated atmosphere with continuous condensation at a constant 120°F (48.9°C) for 33 steel test specimens. Test panels are suspended on a ⅛rpm rotating stage. Air flow and water level control systems maintain required conditions inside the cabinet per Mil. Spec. and ASTM specifications. Air temperature is maintained at 120 ±2°F (48.9 ±1.1°C) by a digital LCD electronic controller. A continuous heater circuit assists the control heater in bringing the cabinet up to temperature prior to testing. Overtemperature protection is provided by an adjustable digital thermostat which cuts off power to the cabinet in case of overheating.

Cabinet interior is stainless steel lined and all interior components are of stainless steel or chrome plated steel construction. Hinged cover consists of two layers of desized cotton cloth mounted on a metal frame. Oil and condensate dripping from the specimens are collected in a drip pan and piped to an external drain.

### Ordering Information

| Catalog No. | | Order Qty |
|---|---|---|
| **Humidity Cabinet** | | |
| **K35200** | Humidity Cabinet, 115V 60Hz | 1 |
| **K35295** | Humidity Cabinet, 220-240V 50Hz | |
| **K35296** | Humidity Cabinet, 220-240V 60Hz | |
| | **Accessories** | |
| **K35210** | Steel Test Panels<br>Soft temper low carbon cold rolled steel, surface ground on both faces to a 10-20 micro-inch finish.<br>2x4x⅛"(51x102x3.2mm) | 33 |
| **380-240-002** | Aluminum Oxide Cloth, 240-grit<br>For test panel preparation.<br>Pack of 50 | 1 |
| **250-000-09F** | ASTM 9F Thermometer<br>Range: 20 to 230°F | 1 |
| **250-000-09C** | ASTM 9C Thermometer<br>Range: –5 to +110°C | |

***For NIST traceable certified thermometers, please refer to the ASTM Thermometer section on pages 184 through 191.***

***Digital Flowmeter option is available for this unit.***

***K35200 Humidity Cabinet***

## Specifications

Conforms to the specifications of:
ASTM D1748; FTM 791-5310
Capacity: 33 rust test specimens
Water Level Control: 8 in. (203mm)
Temperature Control Stability: ±2°F (± 1.1°C) (air temperature)
Heater Range: 0-1500W
Air Metering: 0.878±0.02832m³/h at standard temperature and pressure (31±1 ft³/h)
Air Distribution: 20-diffuser manifold
Rotating Stage: ⅛rpm
Electrical Requirements: CE
115V 60Hz, Single Phase, 13.0A
220-240V 50Hz or 60Hz, Single Phase, 6.8A

## Included Accessories

Monel Test Specimen Hooks (33 sets)

## Dimensions lxwxh,in.(cm)

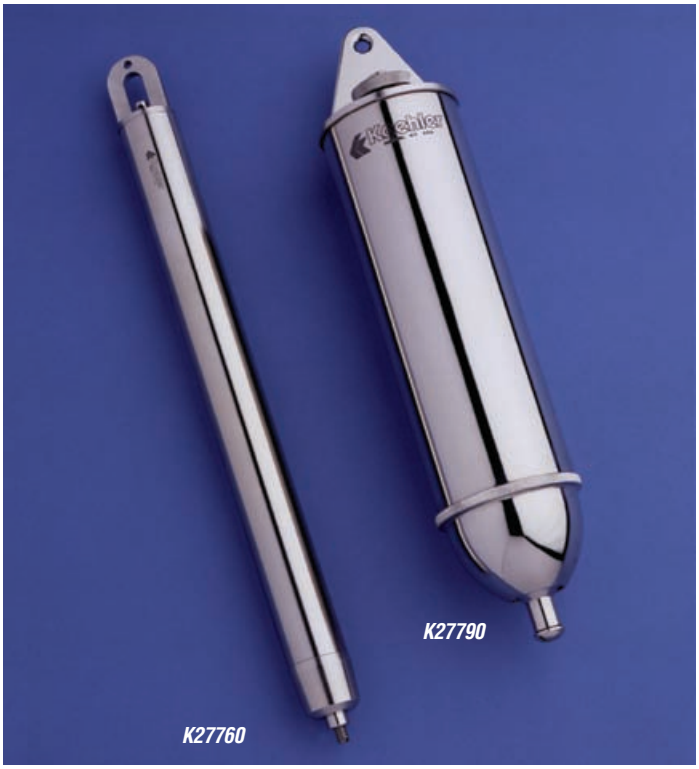
32x28x41½ (81x71x105)
Net Weight: 206 lbs (93.4kg)

## Shipping Information

Shipping Weight: 279 lbs (126.6kg)
Dimensions: 41 Cu. ft.

Koehler INSTRUMENT COMPANY, INC.

# Sampling of Petroleum and Petroleum Products and LP Gases




## Sampling of Petroleum and Petroleum Products

### Sampling Liquefied Petroleum (LP) Gases

## Test Method Standards

**All samplers conform to ASTM D4057 (formerly ASTM D270), D6074 or ASTM D1265 specifications.**

## Sample Thief (Bacon Bomb)

- Obtains bottom samples or samples from any level
- Four different capacities
- Plated brass, stainless steel or acrylic construction
- Standard Viton O-ring seal
- Optional metal-to-metal seal

Obtains samples from storage tanks, tank cars and drums. When the thief strikes the bottom of the tank, a plunger assembly opens to admit the sample. The plunger closes again when the bomb is withdrawn, forming a tight seal. Samples can be taken at any depth with the use of a secondary trip line, or extension rods may be added for obtaining samples at levels of up to 18"(46cm) off the bottom. Equipped with plunger locking cam for tight closure during transport (except for 4 oz 1⅛" dia. model). Special models include a 4 oz (118mL) 'pencil' model for sampling through small diameter pipes and openings, and clear acrylic samplers with plated brass plunger and end pieces. Modified samplers can be supplied for special applications – we invite your inquiries.

**Specifications and Ordering Information**

| Catalog No. | Capacity oz(mL) | Construction | Seal | Outside Diameter (O.D.)in.(cm.) | Overall Length in.(cm) | Shipping Weight lbs(kg) |
|---|---|---|---|---|---|---|
| **K27700** | 32 (946) | plated brass | Viton O-ring | 3⅜ (8.6) | 15 5/32 (38.5) | 13 (5.9) |
| **K27701** | 32 (946) | stainless steel | Viton O-ring | 3⅜ (8.6) | 15 5/32 (38.5) | 13 (5.9) |
| **K27790** | 16 (473) | plated brass | Viton O-ring | 2¾ (7) | 12 1/32 (30.6) | 9 (4.1) |
| **K27795** | 16 (473) | plated brass | Metal Seat | 2¾ (7) | 12 1/32 (30.6) | 9 (4.1) |
| **K27791** | 16 (473) | stainless steel | Viton O-ring | 2¾ (7) | 12 1/32 (30.6) | 8 (3.6) |
| **K27792** | 16 (473) | acrylic | Viton O-ring | 2¾ (7) | 12 1/32 (30.6) | 8 (3.6) |
| **K27780** | 8 (237) | plated brass | Viton O-ring | 2 5/16 (5.9) | 10 5/32 (25.8) | 5 (2.3) |
| **K27785** | 8 (237) | plated brass | Metal Seat | 2 5/16 (5.9) | 10 5/32 (25.8) | 5 (2.3) |
| **K27781** | 8 (237) | stainless steel | Viton O-ring | 2 5/16 (5.9) | 10 5/32 (25.8) | 5 (2.3) |
| **K27782** | 8 (237) | acrylic | Viton O-ring | 2 5/16 (5.9) | 10 5/32 (25.8) | 5 (2.3) |
| **K27770** | 4 (118) | plated brass | Viton O-ring | 1⅞ (4.7) | 9 1/16 (24.6) | 4 (1.8) |
| **K27771** | 4 (118) | stainless steel | Viton-O-ring | 1⅞ (4.7) | 9 1/16 (24.6) | 4 (1.8) |
| **K27772** | 4 (118) | plexiglass | Buna N O-ring | 1⅝ (4.01) | 9 1/16 (24.6) | 3 (1.4) |
| **K27760** | 4 (118) | plated brass | Viton O-ring | 1⅛ (2.8) | 13¼ (33.7) | 3 (1.4) |
| **K27761** | 4 (118) | stainless steel | Viton O-ring | 1⅛ (2.8) | 13¼ (33.7) | 3 (1.4) |
| **K27762** | 4 (118) | acrylic | Viton O-ring | 1⅛ (2.8) | 13¼ (33.7) | 3 (1.4) |

## Sample Thief Extension Rods

Installs in sample thief plunger assembly. Stainless steel with threaded end.

| Catalog No. | Length in. (cm) | Application |
|---|---|---|
| **K277-EXT1** | 1 (2.5) | |
| **K277-EXT2** | 2 (5.1) | |
| **K277-EXT3** | 3 (7.6) | 32,16 and |
| **K277-EXT6** | 6 (15.2) | 8 oz models |
| **K277-EXT12** | 12 (30.5) | |
| **K277-EXT18** | 18 (45.7) | |
| **K277C-EXT1** | 1 (2.5) | |
| **K277C-EXT2** | 2 (5.1) | |
| **K277C-EXT3** | 3 (7.6) | 4 oz models |
| **K277C-EXT6** | 6 (15.2) | |
| **K277C-EXT12** | 12 (30.5) | |
| **K277C-EXT18** | 18 (45.7) | |

## All-Levels Sample Thief

Similar to the standard 16 oz (473mL) Sample Thief (Bacon Bomb), but equipped with an adjustable needle valve opening instead of a plunger to control rate of flow during 'all-levels' and 'running' sampling from storage tanks. Plated brass construction.

**Ordering Information**

| Catalog No. | |
|---|---|
| **K27800** | All-Levels Sample Thief |

## Adjustable-Level Sample Thief

Takes samples at depths up to 12" (30.5cm) from bottom. Similar to the standard 16 oz (473mL) Sample Thief (Bacon Bomb), but with built-in graduated extension rod adjustable between 0-12" (30.5cm). Plated brass construction.

**Ordering Information**

| Catalog No. | |
|---|---|
| **K27900** | Adjustable Level Sample Thief |

## Drum Thief (Sampling Tube)

- Choice of plated brass or stainless steel construction

For tube sampling from barrels and drums. Takes bottom samples or all-levels samples. 40" Long x 1¼" dia. (102x3.2cm). Maximum sample capacity of 24 oz (710mL). Shipping Weight: 6 lbs (2.7kg).

**Ordering Information**

| Catalog No. | |
|---|---|
| **K27400** | Drum Thief, plated brass |
| **K27401** | Drum Thief, stainless steel |

## Weighted Beaker

- Capacity 32 oz. (946mL)
- Choice of ¾" or 1½" (19 or 38mm) opening

For beaker sampling from tank cars, tank trucks, shore tanks, ship tanks and barge tanks. Copper or stainless steel construction with weighted bottom. Includes handle and chained cork. Takes all level samples, running samples, and top, upper, middle, lower and outlet samples. Select ¾" (19mm) opening for light crude oils, light lubricating oils, kerosenes, gasolines, transparent gas oils, diesel fuels, and distillates, or 1½" (38mm) for heavy crude and fuel oils, heavy lubricating oils and nontransparent gas oils. Shipping weight: 6 lbs (2.7kg).

**Ordering Information**

| Catalog No. | |
|---|---|
| **K27600** | Weighted Copper Beaker, with ¾" opening |
| **K27610** | Weighted Copper Beaker, with 1½" opening |
| **K27601** | Weighted Stainless Steel Beaker, with ¾" opening |

*K27400*
*Drum Thief*

*K27600*
*Weighted Beaker*

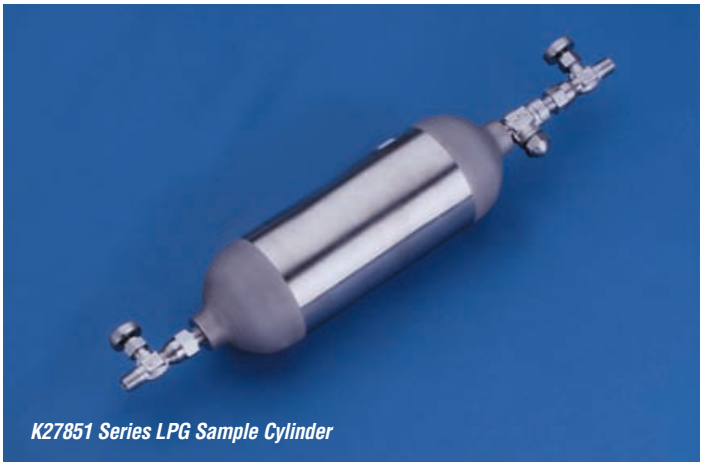
## LPG Sample Containers

- Two-valve type with 20% outage tube
- Built-in pressure relief valve
- Conforming to ASTM D1265 and GPA 2140 specifications

Welded stainless steel cylinders for obtaining representative samples of liquefied petroleum (LP) gases. Two-valve type (¼ IPS), with 20% outage tube and built-in pressure relief valve factory preset between 540 to 600psi (38-42 kg/cm$^2$).

**Ordering Information**

| Catalog No. | |
|---|---|
| **K27851** | LPG Sample Cylinder, 150mL |
| **K27852** | LPG Sample Cylinder, 300mL |
| **K27853** | LPG Sample Cylinder, 500mL |
| **K27854** | LPG Sample Cylinder, 1000mL |
| **K27856** | LPG Sample Cylinder, 3000mL |



*K27851 Series LPG Sample Cylinder*

## Core-Type Sampling Thief (Tulsa Oil Thief)

- Obtains bottom samples or samples from any level
- Butterfly valve on bottom for easy sampling
- Stainless steel and brass construction
- Three Petcocks for draining at different levels

The K28100, Core-Type Sampling Thief is used to manually obtain samples of a liquid, semi liquid or solid state whose vapor pressure at ambient conditions is below 101kPa (crude oil, etc.)

**Ordering Information**

| Catalog No. | |
|---|---|
| **K28100** | Core-Type Sampling Thief |

### Specifications

Conforms to the specifications of: ASTM D4057
Capacity: 33oz.
Empty Weight: 6.187 lbs.
Sample Container Material: Polycarbonate
Markings: Every inch from 3" to 14"
Distance from tank bottom to inlet valve: 1.729"
Max height: 21"
Max length: 4.7"
Max width: 4.2"

# Freezing Point of Aqueous Engine Coolant Solution

## Test Method

**Determines the freezing point of aqueous engine coolant solutions by cooling a sample with continuous agitation until a plateau is observed in a time-temperature curve.**

## Freezing Point Apparatus

- Conforms to ASTM D1177 specifications

Determines freezing points of aqueous engine coolants. Includes 200mL freezing tube with drilled cork, outer flask, motorized stirrer, clamps and stand. Similar to K29700 Freezing Point Apparatus.

Electrical Requirements: CE
115V 60Hz
220-240V 50Hz
220-240V 60Hz

**Ordering Information**

| Catalog No. | | Order Qty |
|---|---|---|
| **K29750** | Freezing Point Apparatus, 115V 60Hz | 1 |
| **K29758** | Freezing Point Apparatus, 220-240V 50Hz | |
| **K29759** | Freezing Point Apparatus, 220-240V 60Hz | |
| **250-000-75F** | ASTM 75F Thermometer Range: –35 to +35°F | 1 |
| **250-000-76F** | ASTM 76F Thermometer Range: –65 to +5°F | |

***For NIST traceable certified thermometers, please refer to the ASTM Thermometer section on pages 184 through 191.***

*K29750 Freezing Point Apparatus*

# Color of Maleic and Phthalic Anhydrides

*K56300 Anhydride Purity Bath*

**Dimensions** lxwxh,in.(cm)
12x12x21 (31x31x54)
Net Weight: 65 lbs (30 kg)
Electrical Requirements: CE
115V 60Hz
220-240V 50/60Hz

**Shipping Information**
Shipping Weight: 76 lbs (35 kg)
Dimensions: 9 Cu. ft.

## Test Method

**Molten samples of maleic or phthalic anhydride are compared with Platinum-Cobalt color standards for determining sample purity and the qualitative stability in the presence of contaminants. High color content normally indicates contamination.**

## Anhydride Purity Bath

- Conforms to ASTM D3366 specifications
- Redundant overtemperature protection circuitry
- Microprocessor-based temperature controller

Electrically heated aluminum block features a microprocessor-based temperature controller with overtemperature protection circuitry and a dual LED temperature display. The heating unit provides temperature stability, heating rates, and minimal temperature gradients which exceed ASTM specifications, and is housed in an insulated steel cabinet with a chemically-resistant painted finish. Up to six samples can be tested at a time using Nessler tubes. Visual color comparisons are made against solutions of Platinum-Cobalt color standards. (Please refer to pages 44-47 for Koehler's line of color measurement and comparison instrumentation.)

**Ordering Information**

| Catalog No. | | Order Qty |
|---|---|---|
| **K56300** | Anhydride Purity Bath, 115V 60Hz | 1 |
| **K56390** | Anhydride Purity Bath, 220-240V 50/60Hz | |
| **K56306** | Nessler Tubes | 6 |

## Automatic Melting Point Range Apparatus

### Test Method

**The melting point of a crystalline solid is the temperature at which the solid to liquid phase transition occurs, referenced at one atmosphere (1 ATM) of pressure.**

- Conforms to BP Appendix 5 - Method 6 and GLP specifications
- Readily interchanged between automatic and manual detection of melting point ranges
- Intelligent Lamp Intensity Control with Soft Start
- Storage capacity for up to 20 sample tests
- User-interactive software and data entry, including easy alphanumeric entry of sample name, ID number, and date
- User selectable operating modes:
  - **AUTO detection mode:** Start/end of melting point range is automatically detected by a photosensing infrared device. The melting process is recorded and viewed on-screen in real-time by a CCD camera.
  - **MANUAL detection mode:** Start/end of melting point range can be selected manually with a key-press by user. Sample melting point can be determined as per BP method by 'Heat & Cool' temperature function. As above, the melting process is recorded and viewed on-screen in real-time by a CCD camera.

The Automatic Melting Point Apparatus is the latest technology for microprocessor-based determinations of melting point ranges of crystalline, powdered and polymeric materials, and is used to assess sample purity. Requires approximately 5mg of sample spread uniformly on a glass slide, covered with a glass coverslip. The slide is placed on a uniformly heated, round furnace and subjected to a heating profile as required by the user. Precise temperature control gives reproducible results to within 1%. The unit contains an automatic temperature safety cut-off feature if no melting points are detected 15°C above the expected melting point or if the oven reaches 315°C. The melting process is magnified, recorded, and viewed on-screen in real-time by a CCD camera. The change in physical appearance of the sample with respect to temperature is recorded, and the start/end of melting is observed automatically. A representation of the entire process can be printed out in graphical form for validation.

**Dimensions** lxwxh,in.(cm)
Main Unit: 16½x12¼x13 (42x31x33)
Monitor: 8x5½x5½ (20x14x14)
Net Weight: Main Unit: 22 lbs (10 kg)
Monitor: 1.8 lbs (0.8 kg)

**Shipping Information**
Weight: 29 lbs (13 kg)
Dimensions: 3.6 Cu. ft.

| Ordering Information | | |
|---|---|---|
| **Catalog No.** | | **Order Qty** |
| **K90100** | Automatic Melting Point Range Apparatus, 115V 60Hz | 1 |
| **K90190** | Automatic Melting Point Range Apparatus, 220V 50Hz | |
| | **Accessories** | |
| **K90100-1** | Glass slides (pack of 500) | |
| **K90100-2** | Cover slips (pack of 1000) | |
| **K90100-3** | Sampling jig | |

*K90190 Automatic Melting Point Range Apparatus*

### Specifications

Conforms to the specifications of:
BP Appendix 5-Method 6; GLP
Visual Image: 10x magnified displayed on monitor
Temperature Range: ambient + 5 to 315°C
Heating Rates: 0.2, 0.5, 1.0, 2.0, 3.0, 6.0, 12.0°C/min
Temperature Readability: 0.1°C
Cooling Time: 20 minutes (300°C to ambient)
Temperature Accuracy: ±0.5°C (ambient + 5 to 200°C)
±0.8°C (200 to 315°C)
Sample size: 5 mg (approximately)
Sample Holder: Glass Slide ≤1mm ±0.02mm thick
Sample Cover: Glass Coverslip ±0.17mm thick
Temperature Sensor: Pt-100 (2 wire RTD)
Test Storage: Up to 20 tests with parameters
Electrical Requirements: CE
115V, 60Hz, Single Phase
220V, 50Hz, Single Phase

# General Purpose Baths

### Constant Temperature Water Baths

- Accurate Microprocessor Control
- Three User-defined Temperature Preset Buttons
- Redundant Safety Backup
- Front Panel Lockout
- Electronic Calibration

Economical constant temperature water baths offer superior temperature control, range, and uniformity. Bath fluids can be controlled at temperatures as high as 100°C (60°C without cover) with 0.1°C precision and +/- 0.2°C uniformity. Bath temperature is displayed continuously on a bright, easy-to-read LED panel in your choice of °C or °F. Set point temperature is recalled with just the touch of a button. Three user-defined temperature preset buttons allow for quick selection of often used temperature set points.

Dual thermostats provide optimum protection for your work and water bath. The high limit alarm alerts you if bath temperature exceeds your pre-set limit. A secondary Safety Set thermostat guards against thermal runaway, automatically disconnecting heater power should bath temperature get too high or the liquid level drop too low.

The Constant Temperature Water Baths are also designed for operating convenience. The steeply gabled, polycarbonate cover accommodates glassware of varying heights and tilts out of your way when loading or removing samples, allowing condensate to drain neatly back into the bath.

*K33056 General Purpose Water Bath, 10L*

### Specifications

Temperature Control: 0.1°C setpoint and °C/°F switchable LED display
Temperature Stability: +/- 0.2°C
Temperature Range: Ambient to 100°C with cover,
Ambient to 60°C without cover

**Ordering Information**

| Catalog No. | Capacity | Electrical Requirements CE | Overall Dimensions LxWxH | Opening Dimensions LxWxH | Shipping Weight |
|---|---|---|---|---|---|
| **K33050**<br>**K33051** | 2L (0.5 gal) | 120V, 50/60Hz, 2.5A<br>240V, 50/60Hz, 1.25A | 8.94x7.90x8.13 in<br>22.71x20.07x20.65 cm | 5.31x5.88x5.81 in<br>13.49x14.94x14.76 cm | 11 lbs<br>4.99 kg |
| **K33052**<br>**K33053** | 2L shallow<br>(0.5 gal) | 120V, 50/60Hz, 2.5A<br>240V, 50/60Hz, 1.25A | 9.44x13.65x8.13 in<br>23.98x34.67x20.65 cm | 5.81x11.69x2.50 in<br>14.76x29.69x6.35 cm | 12 lbs<br>5.44 kg |
| **K33054**<br>**K33055** | 5L (1.3 gal) | 120V, 50/60Hz, 4.2A<br>240V, 50/60Hz, 2.1A | 9.44x13.65x8.13 in<br>23.98x34.67x20.65 cm | 5.94x11.75x5.94 in<br>15.09x29.85x15.09 cm | 15 lbs<br>6.80 kg |
| **K33056**<br>**K33057** | 10L (2.6 gal) | 120V, 50/60Hz, 4.2A<br>240V, 50/60Hz, 2.1A | 15.43x14.90x8.13 in<br>39.19x37.85x20.65 cm | 11.69x12.75x5.94 in<br>29.69x32.39x15.09 cm | 23 lbs<br>10.43 kg |
| **K33058**<br>**K33059** | 20L (5.2 gal) | 120V, 50/60Hz, 8.3A<br>240V, 50/60Hz, 4.15A | 15.19x21.65x8.13 in<br>38.58x54.99x20.65 cm | 11.50x19.50x5.88 in<br>29.21x49.53x14.94 cm | 30 lbs<br>13.61 kg |
| **K33060**<br>**K33061** | 28L (7.3 gal) | 120V, 50/60Hz, 8.3A<br>240V, 50/60Hz, 4.15A | 15.19x21.65x10.13 in<br>38.58x54.99x25.73 cm | 11.63x19.56x7.94 in<br>29.54x49.68x20.17 | 33 lbs<br>14.97 kg |

# General Purpose Baths

***K33064 Constant Temperature Circulating Bath***

## Constant Temperature Circulating Baths

- Above Ambient Temperature Control
- Available in Three Different Capacities: 6, 13, and 28 Liter
- Large Reservoir Opening
- Microprocessor temperature control with °C/°F digital temperature set and display
- Adjustable Over-Temperature protection and Low-Liquid Cutoff

**Programmable Model** - Constant temperature circulating bath provides precise temperature control stability of ±0.01°C and features time/temperature programming, remote probe capability, and a variable speed pressure/suction (duplex) pump. An RS232 interface and PC programming software are standard while LabView™ drivers and Excel® macros provide even greater programming and data logging conveinience. A full graphic LCD display and multi-language help menus simplify operation and set-up.

**Standard Model** - Economical constant temperature circulating bath model. Microprocessor temperature control ranges from 5°C to 150°C with ±0.05°C stability. This model features a bright set-and-read LED display with a readout accuracy of ±0.5°C, three user-defined set point buttons, and a 2-speed pressure (simplex) pump suitable for closed loop applications.

## Specifications

Temperature Range:
K33064, K33065: +5°C to 200°C
All Other Models: +5°C to 150°C
Temperature Stability:
Programmable Model: ±0.01°C
Standard Model: ±0.05°C
Readout Accuracy:
Programmable Model: ±0.25°C
Standard Model: ±0.5°C
Temperature Readout: °C or °F
Pressure Flow Rate:
Programmable Model: 30 lpm max. (60 Hz)
22 lpm max. (50 Hz)
Standard Model: 2-speed, 9 or 15 lpm
Suction Flow Rate:
Programmable Model: 22 lpm max. (60 Hz)
15 lpm max. (50 Hz)
Standard Model: N/A
Heater:
Programmable Model: 1100 Watts (60 Hz)
2200 Watts (50 Hz)
Standard Model: 1100 Watts (60 Hz)
1600 Watts (50 Hz)

## Ordering Information

| Catalog No. | Model | Capacity | Electrical Requirements CE | Overall Dimensions LxWxH | Working Access LxWxD | Shipping Weight |
|---|---|---|---|---|---|---|
| **K33062**<br>**K33063** | Standard | 6L (1.6 gal) | 120V, 50/60Hz<br>240V, 50/60Hz | 14.25x8.25x8.14 in<br>37.5x21x35.6 cm | 5.25x5.25x5.5 in<br>13.3x13.3x14 cm | 24 lbs<br>11 kg |
| **K33064**<br>**K33065** | Programmable | 6L (1.6 gal) | 120V, 50/60Hz<br>240V, 50/60Hz | 14.25x8.25x8.14 in<br>37.5x21x35.6 cm | 5.25x5.25x5.5 in<br>13.3x13.3x14 cm | 30 lbs<br>14 kg |
| **K33066**<br>**K33067** | Standard | 13L (3.4 gal) | 120V, 50/60Hz<br>240V, 50/60Hz | 15.5x10.88x14.75 in<br>39.4x27.6x37.5 cm | 5.25x8.5x7.75 in<br>13.3x21.6x19.7 cm | 31 lbs<br>14 kg |
| **K33068**<br>**K33069** | Programmable | 13L (3.4 gal) | 120V, 50/60Hz<br>240V, 50/60Hz | 15.5x10.88x14.75 in<br>39.4x27.6x37.5 cm | 5.25x8.5x7.75 in<br>13.3x21.6x19.7 cm | 40 lbs<br>18 kg |
| **K33070**<br>**K33071** | Standard | 28L (7.3 gal) | 120V, 50/60Hz<br>240V, 50/60Hz | 22.75x13.19x14.75 in<br>55.8x33.5x37.5 cm | 12.13x10.38x8 in<br>30.8x26.4x120.3 cm | 42 lbs<br>19 kg |
| **K33072**<br>**K33073** | Programmable | 28L (7.3 gal) | 120V, 50/60Hz<br>240V, 50/60Hz | 22.75x13.19x14.75 in<br>55.8x33.5x37.5 cm | 12.13x10.38x8 in<br>30.8x26.4x120.3 cm | 50 lbs<br>23 kg |

# Water in Petroleum Products & Bituminous Materials by Distillation

*K31800 Metal Still*

## Dean & Stark Moisture Test Apparatus

- Conforms to ASTM D95 and related specifications

Consists of 400mm condenser, 10mL receiver, 1000mL flask and mounting equipment.

| Ordering Information | |
|---|---|
| **Catalog No.** | |
| **K31830** | Dean & Stark Apparatus |

## Test Method

**Determines the water content in petroleum products, tars, emulsified asphalts and other bituminous materials by the distillation method.**

## Distillation Apparatus

- Conforms to ASTM D95, E123, D244 and related specifications

Consists of still, ring burner, glassware and all mounting hardware.

### Specifications

Conforms to the specifications of:

ASTM D95, E123, D244, D370*; AASHTO T55, T59; API MPMS Ch. 10.5; IP 74, 291; FTM 791-3001; ISO 3733; NF T 60-113

*requires different glassware–information is available upon request.

### Shipping Information

K31800: Shipping Weight: 10 lbs (4.5kg)
Dimensions: 1.3 Cu. ft.

K31810/K31820: Shipping Weight: 18 lbs (8.2kg)
Dimensions: 2.8 Cu. ft.

| Ordering Information | | |
|---|---|---|
| **Catalog No.** | | **Order Qty** |
| **K31800** | Metal Still<br>Plated brass and copper, with lid and clamp assembly, gasket and O-ring seal. | 1 |
| **K31910** | Ring Burner, 5" (12.7cm) dia. | 1 |
| **K31810** | Glassware Set<br>Includes 400mL condenser, 10mL and 25mL receiving traps | 1 |
| **K31820** | Mounting Equipment<br>Consists of stand and connecting hardware | |

# General Purpose Heater

## Utility Heater

- For general laboratory applications
- Precise, reproducible settings
- 1000W or 1250W nichrome heater option
- Accepts flat bottom and round bottom beakers and flasks

Variable control electric heater designed for efficient, reproducible heating of flat bottom and round bottom beakers and flasks. Electronic unit control with reference dial permits fine temperature adjustment and accurate repeatable settings. Includes porcelain refractory heater with nichrome element (1000W or 1250W) and refractory support plate that reverses to accept different size beakers and flasks. Polished stainless steel housing has cooling vents and two dovetail clamps to accommodate accessory support rod. Line switch and 6ft. (1.8m) three-conductor line cord and plug are included.

Electrical Requirements: CE
115V 60Hz
220-240V 50/60Hz

**Dimensions** lxwxh,in.(cm)
5x5x10 (12.7x12.7x25.4)
Net Weight: 4½ lbs (2.0kg)

### Shipping Information

Shipping Weight: 8 lbs (3.6 kg)
Dimensions: 1.5 Cu. ft.

| Ordering Information | |
|---|---|
| **Catalog No.** | |
| **K42000** | Utility Heater, 115V 60Hz, 1000W |
| **K42001** | Utility Heater, 115V 60Hz, 1250W |
| **K42090** | Utility Heater, 230V 50/60Hz, 1000W |
| **K42091** | Utility Heater, 230V 50/60Hz, 1250W |

*K42000 General Purpose Utility Heater*

# Refractive Index of Petroleum Products

## Test Method

**Refractive index is a fundamental physical property that is used in conjunction with other properties to characterize pure hydrocarbons and their mixtures. It is a useful property for concentration measurements, purity determinations and chemical identification.**

## Automatic Petroleum Refractometer

- Conforms to ASTM D1218, D1747 and D5006 test specifications
- Electronic heating and cooling Peltier system eliminates the need for a circulating water bath
- Automated and precise refractive index measurements
- Rugged sapphire prism
- Designed for samples ranging from clear to highly colored, dark and opaque
- Clear graphical LCD display with on-screen instructions and full menu operation
- Multipoint calibration routines maximize accuracy
- RS232C and centronics communication ports

The Koehler Automatic Refractometer uses precision optics and superior image analysis to extend the repeatability and accuracy of refractive index measurements for petroleum products. Subjectivity is removed from tests results because no manual activities such as aligning shadowlines or reading analog scales are necessary. Opaque hydrocarbons present no problem for this unit which uses reflected light measurement technology as opposed to manual refractometers which are of the transmission type. The dual temperature control system and flat, easy clean sample area make the instrument ideal for viscous or sticky samples.

Two models are available. Models K27550 and K27560 conform to ASTM D1218 and D1747 (maximum temperature 100ºC) and measures to the fifth decimal place refractive index or one hundredth place in percent solids. The K27550 also has a built in data storage system with secure electronic signature recording.

The refractometer incorporates numerous innovations designed to improve the accuracy of petroleum product testing. A 589 nanometer filter gives true Sodium D-Line refractive index readings. The large graphical LCD is easy to read and provides complete sample analysis documentation including the reading, temperature and scale name of the screen.

Set-up, diagnostic and calibration routines are displayed with easy to follow step-by-step instructions. User-developed customer calibration curves may be programmed allowing automatic temperature correction and direct percent concentration, percent reaction completion, etc. This unit has been used successfully throughout the petrochemical industry.

### Ordering Information

| Catalog No. | |
|---|---|
| **K27550** | Automatic Petroleum Refractometer for D1218 and D1747<br>110-240V 50/60Hz<br>Includes data storage |
| **K27560** | Automatic Petroleum Refractometer for D1218 and D1747<br>110-240V 50/60Hz |
| | **Accessories** |
| **K27504** | Calibration Fluid,<br>Certificate of NIST traceability included. |
| **K27505** | Refractometer Communication Software Package,<br>with real-time data export into Microsoft® Excel. |

***K27550 Automatic Refractometer***

## Specifications

Measurement Scales:
- Refractive Index (RI)
- BRIX (% sucrose)
- Temperature Corrected RI
- Temperature Corrected BRIX
- Ten User-Programmable Scales

Illumination: 589nm light emitting diode with interference filter (estimated life: 100,000 hrs)

Range:
- Dissolved Solids: 0 to 95% solids
- Refractive Index: 1.29000 to 1.70000nD (nD - Sodium D-Line Refractive Index)

Readability:
- Standard Mode: 0.1% Solids 0.0001nD
- Extended Mode: 0.01% Solids 0.00001nD

Precision:
- Standard Mode: ±0.02% Solids ± 0.00002nD
- Extended Display Mode: Refractive Index Standard Oils ± 0.00002 Typical clear aqueous samples, % Solids Temperature Compensated, as sucrose ±0.02%

Calibration Fluid: refractive index standard oil, NIST traceable nominal value 1.495 RI, 67.61 BRIX

Sample Types: Transparent, translucent or opaque

Prism Assembly: Stainless steel, synthetic sapphire sealed with solvent-resistant epoxy

Calibration:
- 1 point - Water only
- 2 point - Water and refractive index or Brix standard

Electrical Requirements: CE
- 110-240V 50/60Hz

**Dimensions** lxwxh,in.(cm)
15½x10x4½ (39½x25½x11½)

Net Weight: 23 lbs (10½kg)

## Shipping Information

Shipping Weight: 30 lbs (14kg)

Dimensions: 5 Cu. ft.

Koehler INSTRUMENT COMPANY, INC.

# Calibration of Liquid-in-Glass Thermometers

## Thermometer Calibration Bath

- Calibrates thermometers, temperature controllers and other temperature instruments against a factory certified thermometer traceable to NIST standards
- Verifies accuracy of routine thermometers
- For temperatures between ambient to 200°C (–30°C with the use of circulated refrigerated coolant)
- Digital temperature control with temperature uniformity of ±0.02°C
- Built-in ice bath for performing ice point calibrations
- Meets the requirements of NBS Monograph 150

Constant temperature calibration bath for liquid-in-glass thermometers, dial thermometers, digital thermometers and other temperature measuring instruments. Consists of an oil bath with digital electronic control providing temperature uniformity of ±0.02°C in the range –30°C to +200°C. Accessory Standard Thermometer is calibrated and certified traceable to NIST standards. Turntable rack inserts in bath to immerse six thermometers or temperature probes and the standard thermometer. Bath depth of 12" (30.5cm) accommodates all partial immersion thermometers and most 15" total immersion thermometers.

Features digital setpoint and display (°C/°F switchable) of bath temperature for maximum convenience, and overtemperature control to prevent accidental overheating. Built-in cooling coil permits circulation of tap water or refrigerated coolant to permit operation at sub-ambient temperatures or to facilitate rapid cool down for multi-point calibrations. Equipped with drains for oil bath and ice bath.

**Dimensions:** lxwxh,in.(cm)
28x24x21(71x61x53)
Net Weight: 52¾ lbs (23.9kg)

**Shipping Information**
Shipping Weight: 66 lbs (30kg)
Dimensions: 8.2 Cu. ft.

### Specifications

Temperature Range: –30°C to +200°C
*For sub-ambient temperatures, refrigerated recirculating coolant is required from an external source.*
Temperature Uniformity: ±0.02°C
Temperature Limit Control: –16.7°C (30°F) above setpoint and 204°C (400°F) maximum
Heater Range: 0-750W
Circulator: ⅓₀ hp impeller
Working Depth: Oil Bath: 12" (30.5cm)
Ice Bath: 10½" (26.7cm)
Electrical Requirements: CE
115V 60Hz
220-240V 50/60Hz

**Ordering Information**

| Catalog No. | | Order Qty |
|---|---|---|
| **K26500** | Thermometer Calibration Bath, 115V 60Hz | 1 |
| **K26590** | Thermometer Calibration Bath, 220-240V 50/60Hz | |
| | **Accessories** | |
| **K26501** | Standard Thermometer, certified traceable to NIST Standards at 0, 20, 37, 56, 80, 100, 121, 140, 160, 180 and 200°C | 1 |
| **K26503** | Thermometer Magnifier(10X) | 1 |
| **K26502** | Thermometer Carrying Case, holds K26501 Standard Thermometer | 1 |

# pH / Conductivity Meters

## pH Meter

This bench-top pH meter is an ideal help in every laboratory for routine or R&D level measurement. This instrument measures pH, mV and has 40- point data memory storage. Instrument has two operating modes -
1. Standard mode
2. GLP mode: 40 data readings can be stored, printed and scanned on display. For GLP mode, additional entries of sample name and ID number can be stored.

The optional Data logging function enables the user to store 24 data points consisting of pH, temperature and time readings. For example, as required in kinetic study or in any chemical reaction. Time intervals from 1min. to 1Hr. in steps of 1min. are available. User entries of pH limit values make the data more defined and informative.

Conductivity Meter

Koehler offers the perfect choice of a bench top conductivity meter for measurements in the laboratory - whether routine or at the R & D level. The conductivity meter offers better operating comfort and measuring confidence in all areas of application. Due to a user selective temperature function, the instrument calculates the conductivity at the reference temperature 25 ± 0.1°C with a linear function.

Conductivity is an important factor in water analysis for quality of drinking water, direct ionic concentration measurement in pharmaceutical preparations, waste water treatment plants, pollution control in lakes & rivers, boiler feed water and oceanography to determine salinity and TDS.

### Specifications

Temperature Range: 0 to 150°C
Temperature Resolution: 0.1°C
Temperature Accuracy: ± 0.2°C
Display: 20 x 2 line back-lit LCD
Keyboard: Aphanumeric splash water-proof polyester soft keys
Output: 1 – Parallel Port for Printer, 1 – RS232C for PC
Environmental Operating Temperature: Ambient to 45°C
Relative Humidity: 5 to 90% non-condensing
Electrical Requirements: CE
115V 60Hz
230V 50Hz

**Dimensions** wxdxh,in.(cm)
12x8.7x27.6 (30.5x22x70)
Net Weight: 4.85 lbs (2.2kg)

**Ordering Information**

| Catalog No. | |
|---|---|
| **K90601** | pH Meter, 115V 60Hz |
| **K90691** | pH Meter, 230V 50Hz |
| **K90602** | Conductivity Meter, 115V 60Hz |
| **K90692** | Conductivity Meter, 230V 50Hz |
| **K90603** | pH / Conductivity Meter, 115V 60Hz |
| **K90693** | pH / Conductivity Meter, 230V 50Hz |

# Automatic Titration

## Test Method

**For determination of Total Acid Number (TAN), Total Base Number (TBN), Mercaptan Sulfur and Karl Fischer Water Content of petroleum products, lubricants and transformer insulating oils. Titration is the fundamental chemical analysis procedure whereby the concentration of a chemical substance in solution is determined by reacting it with a measured amount of another chemical. The Auto titrator performs this analysis using a motor driven dispenser, stirred reaction vessel and electrodes which sense the completion of reaction by measuring the potential difference between two electrodes. Automatic Titration increases accuracy, repeatability and reproducibility as well as minimizing errors in calculation and documentation.**

## Automatic Titrator

The Automatic Titrator is capable of performing a wide range of Titrations:

- Acid-base or aqueous titration
- Redox titration
- Complexometric titration or EDTA titration
- Blank titration
- Silver Assay titrations
- Non-aqueous titration
- Argentometric or Precipitation titration
- Voltametric / KF Titration
- Back titration

The Automatic Titrator is provided with two-point auto calibration and standardization (zero offset). The instrument is capable of displaying pH and mV of the sample, with temperature compensation. The Automatic Titrator can accept a variety of electrodes to cater to various applications in different fields. The liquid path is comprised of Teflon tubing, a Teflon lined valve and gas tight burette with a Teflon plunger head. It creates a chemically inert system for any sensitive analysis. The instrument is supplied with high speed vortex stirrer with digital speed indication. This specially designed stirrer provides excellent homogenous mixing of samples. An optional magnetic stirrer is also available.

### Ordering Information

| Catalog No. | |
|---|---|
| **K90500** | Automatic Potentiometric Titrator, 115V, 60Hz |
| **K90590** | Automatic Potentiometric Titrator, 230V, 50Hz |

#### Accessories

| | |
|---|---|
| **K90500-1** | Karl Fischer Titrator Burette Assembly |
| **K90500-2** | Filter Desiccant Dryer Tube |
| **K90500-3** | Magnetic Stirrer with Holding Ring |
| **K90500-4** | Magnetic Stirrer with Electrode Arm |
| **K90500-5** | Vessel Heating / Cooling Accessory |
| **K90500-6** | pH Checker |

*K90500 Automatic Potentiometric Titrator*

## Specifications

Conforms to the Specifications of:
ASTM D664, D2896, D3227, D4739
Principle: Volume determination by equivalence point, end point or pH STAT.
Control: Microcontroller based
mV range: ± 3200 mV.
Accuracy: ± 0.1 mV (± 0.0016 pH).
Amplifier input impedance: > 10 ohms
Burette Resolution: 1/5000 for 5 ml, 1/10000 for 10 ml, 1/5000 for 25 ml.
Filling time: Less than 20 seconds
Keyboard: Alphanumeric splash waterproof polyester soft keys.
Display: 40 x 2 line back lighted liquid crystal display (LCD).
Titration Head: Manual stand with swiveling arm.
Stirrer System: Microcontroller based variable speed, high torque vortex stirrer with digital indication. (Magnetic Stirrer optional)

**Sensors:**

Electrodes for Potentiometric titration - (pH, Ion, Redox, Argentometric).
a) Any combination electrode. b) Differential Electrode System comprising sensing (Indicator) Electrode with BNC Connector and Reference Electrode with 4mm Banana Connector.
Electrode for KF/Voltametric titration with BNC/TNC Connectors.
Temperature sensor (PRT/PT100)
Calibration: 3-point Calibration with user entered buffer values and standardization with 7 pH buffer.
End Point detection: a) Potentiometric b) Voltametric c) Thermometric and Photometric.
Cut-off criteria: a) Volume b) End point c) mV/pH.

**Methods:**

Titrations:
a) Acid base b) Nonaqueous c) Redox d) Preciptiation
e) Complexometric f) back titration
KF titration (Optional)
Results: a) Molarity b) % Assay(wt), c) % volume (ml) d) ppm e) mg/l f)mg/g g)g/l h) meq/l i) mol/kg j) TAN and TBN for oil samples.
Method Storage: 50 methods with parameters.
Titrant Molarity storage: 20 values
Input/Output Peripheral Interface:
(a) Parallel Port: 1 - for printer
(b) Serial Port: 2 - for Balance & PC
Electrical Requirements: CE
115V, 60Hz
230V, 50Hz

Koehler INSTRUMENT COMPANY, INC.

# Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter

## Test Method

**Heat of combustion is determined in this test method by burning a weighed sample in an oxygen bomb calorimeter under controlled conditions. The heat of combustion is computed from temperature observations before, during and after combustion with proper allowances for thermochemical and heat transfer corrections. Either isothermal or adiabatic calorimeter jackets can be used.**

## Automatic Calorimeter

The automatic calorimeter is the latest system for determining gross calorific values of liquids and solid fuels. A higher level of automation with extremely simple handling characterizes this device.

In addition to the Isoperibolic measurement procedure, a Dynamic (reduced-time) mode is also available for the user. Different working temperatures can be selected for both procedures based on the temperature of the connected water.

To provide a supply of cooling water, the calorimeter can be connected to a standard thermostat or an appropriate permanently installed water connection, with a connection valve. The unit is equipped with a very convenient operating panel through which operation of the device takes place. The graphical display with active back lighting displays the appropriate status messages. The temporal course of a measurement that has been started and all current parameters of the weighed in sample can be constantly monitored and are arranged to be clearly visible.

Connections for analysis scale, printer, sample rack for identifying and managing samples are already integrated into the basic device. The network connection and the special configuration for data exchange can be implemented at any time with LIMS.

In combination with special halogen-resistant decomposition vessels quantitative decompositions can be performed to determine halogen and sulfur content.

**Dimensions** lxwxh,in.(cm)
17½x17¾x19¾ (440x450x500)  Net Weight: 66 lbs (30 kg)

## Specifications

Conforms to the specifications of:
ASTM D240; D4809; D5865; D1989; D5468; E711; ISO 1928; DIN 51900; BS1016
Measurement range: 40,000 J
Measuring mode: Isoperibolic 25°C; Isoperibolic 30°C; Dynamic 25°C; Dynamic 30°C
Isoperibolic Measuring Time: Approximately 22 min
Dynamic Measuring Time: Approximately 7 min
Oxygen Operating Pressure: 30 bar
Cooling Medium: Water via line, flow through quantity 60 + 10 liters / hour
Water Operating Pressure: 1 – 1.5 bar max.
Water Test Pressure: 10 bar
Interfaces: Serial (RS232); Parallel; Keyboard; Sample rack; External monitor

### Ordering Information

| Catalog No. | |
|---|---|
| **K88800** | Automatic Calorimeter, 115V 60Hz |
| **K88890** | Automatic Calorimeter, 220V 50Hz |

#### Accessories

| | |
|---|---|
| **K88800-1** | Cooling water supply unit, 115V 60Hz |
| **K88890-1** | Cooling water supply unit, 220V 50Hz |
| **K88800-2** | Pressure Gauge, Oxygen<br>To reduce the pressure of the oxygen cylinder to 30 bar |
| **K88800-3** | Standard Decomposition Vessel |
| **K88800-4** | Decomposition Vessel, Halogen Resistant<br>For quantitative decomposition determine halogen and sulfur content |
| **K88800-5** | Connection valve<br>Required for permanently installed water connection |

# Automatic Filter Plugging Tendency Analyzer (FPT)

## Test Method

**Determines the Filter Plugging Tendency (FPT) of distillate fuel oils where the end use demands an exceptional degree of cleanliness. This test is applicable to fuels within the viscosity range of 1.50 to 6.00 mm2/s (cSt) at 40°C. The test is not applicable to fuels that are not clear and bright because water interferes with the measurement of filter plugging. Causes of poor filterability might include fuel degradation products, contaminants picked up during storage or transfer, or interaction of the fuel with the filter media. Any of these could correlate with orifice or filter system plugging, or both.**

## Automatic Filter Plugging Tendency Analyzer

- Integrated Cooling System equipped with a single stage gas motor compressor CFC free
- Measuring device complete with support for filter, Beakers, PT100 sensor Class A, level sensor, pressure gauge, tubes and joints.
- Pump 20 mL/min
- 6.4" TFT/LCD built-in touch screen panel PC for the managing of the analyzer by means of Lab-Link Software
- USB connection to an external printer or external PC
- Storage capacity for more than 60,000 analysis

## Specifications

Conforms to the specifications of:
ASTM D2068; IP 387
Electrical Requirements: CE
115V 60Hz
220-240V 50/60Hz

*KLA-6 Automatic Filter Plugging Tendency Analyzer (FPT)*

### Ordering Information

| Catalog No. | |
|---|---|
| **KLA-6** | Automatic Filter Plugging Tendency Analyzer (FPT), 115V 60Hz |
| **KLA-6 (220)** | Automatic Filter Plugging Tendency Analyzer (FPT), 220-240V 50/60Hz |

#### Accessories

| | |
|---|---|
| **KLA-1820-8013** | Glass Fibre Filters, pk of 100 |
| **KLA-PT100-CAL** | Calibration Box and Cables |
| **KLA-DB-KIT** | Kit of Connectors and Cables for Cold range |

# Oxidation Stability of Foods, Oils, Fats and Biodiesel Fuels

## Test Method

**For the determination of the oxidation stability of samples (solid, semi-solid, or liquid), in order to determine product quality and obtain value added information related to the fat oxidation processed in samples of foods, oils, fats and Biodiesel Fuels.**

## Oxidation Test Reactor

The Oxidation Test Reactor is a versatile instrument suitable for a wide range of oxidation stability and shelf-life applications including:

- Prediction of the oxidation stability during shelf-life studies, by analyzing the product at defined time intervals and building an experimental curve
- Evaluation of the adequacy of storage conditions
- Evaluation of an optimal packaging solution
- Comparison of the oxidation stability of different formulas for food preparations
- Evaluation of the oxidative stability of vegetable oils of different botanical origin
- Evaluation of the effectiveness of antioxidants
- Information on product oxidation when the oxidation flex is not visible, especially for products with a low fat content (4-5%). In this case, product oxidation can be achieved by combining the Oxidation Test Reactor with the gas chromatographic technique.

The Oxidation Test Reactor is a complete solution, controlled entirely by the Windows®-based oxidation software capable of providing high added value information concerning fat oxidation processes in foods, oils, fats and biodiesel fuels.

The Oxidation Test Reactor works directly on the whole sample without the need for preliminary fat separation, and is suitable for the determination of the quality and the state of preservation of the sample.

An extremely simple and intuitive instrument equipped with two separate titanium chambers in order to analyze the same sample in duplicate or different samples at the same time, under the same conditions.

The stability of the sample is determined by accelerating the oxidation process using high temperatures (from Ambient to 110°C) and a pre-determined oxygen pressure. Oxygen is consumed during fat oxidation and it is this decrease in oxygen pressure that enables us to obtain useful information concerning the sample.

The intuitive software controls the entire process in a user friendly way and the operator can record data in a database, compare tests, export the data to an Excel file, filter and order the data quickly and easily.

*K83100 Oxidation Test Reactor*

### Specifications

Based on the Specifications of:
ASTM D942; IP 142
Temperature Range: Ambient to 110°C
Number of Oxidation Chambers: 2
Chamber Capacity: 100mL
Pressure Range: 0 – 8 bar
Interface: USB
Overpressure: Safety Valve
Out of Range Temperature: Visual Alarm
Damaged Probe: Visual Alarm
Electrical Requirements: CE
220-240VAC, 50/60Hz

### Included Accessories

Oxidation Software
USB Cable
Sample Holder (6)
Spacer (4)

### Dimensions wxdxh,in.(cm)

14.6 x 19.4 x 7.6 (36.5x48.5x19)
Net Weight: 36.3 lb (16.5 kg)

| Ordering Information | |
|---|---|
| **Catalog No.** | |
| **K83100** | Oxidation Test Reactor, 220-240V 50/60Hz |

# Additional Accessories

Additional equipment, materials and/or reagents are required to perform some of the test procedures in the preceding pages. Please refer to the applicable test method for further information, or contact Koehler for assistance.

## Aniline Point and Mixed Aniline Point of Petroleum Products and Hydrocarbon Solvents ..... Pages 42-43

ASTM D611; IP 2, ISO 2977; DIN 51775; FTM 791-3601

Pipets, 10mL and 5mL
Laboratory Balance
Oven
Rubber Suction Bulb
Safety Goggles
Plastic Gloves
Aniline
Calcium Sulfate or Sodium Sulfate, anhydrous
n-Heptane
Air Supply (for Automatic Aniline Apparatus)

## Saybolt Color of Petroleum Products ..... Pages 44, 46-47

ASTM D156; DIN 51411; FTM 791-101

Acetone or other Solvent
Soap
Qualitative Filter Papers
Distilled Water

## ASTM Color of Petroleum Products (ASTM Color Scale) ..... Pages 45-46

ASTM D1500; IP 196; ISO 2049; FTM 791-102

Solvent Kerosene (for dark samples)
Distilled Water

## Distillation of Petroleum Products at Reduced Pressures ..... Pages 53-54

ASTM D1160

Toluene
Cyclohexane
n-Tetradecane
1L Beaker
Boiling Chips
Nitrogen
Balance
n-Hexadecane
Calcium Chloride
Silicone Fluids

## Sulfur in Liquefied Petroleum Gases (Oxy-Hydrogen Burner) ..... Page 58

ASTM D2784

Oxygen
Nitrogen
Acetone
Hydrogen Peroxide
Methylene Blue
Alcohol
Thorin
Perchloric Acid
Spectrophotometer
Sodium Hydroxide
Low Sulfur Acetone
Safety Shield
Hydrogen
Sulfuric Acid
Isopropanol
Glycerin
Vacuum Source
Distilled Water
Carbon Dioxide
Barium Chloride Dihydrate
Denatured Ethyl Alcohol
Hydrochloric Acid
Barium Perchlorate
Fleisher's Methyl Purple Indicator

## Traces of Volatile Chlorides in Butane-Butene Mixtures ..... Page 58

ASTM D2384

Mercuric Thiocyanate
Potassium Nitrate
Saturated Calomel Electrolyte
Mercury-Calomel Mixture
Silver Nitrate
Gelatin
Acetone
Hydrochloric Acid
Perchloric Acid
Agar Powder
Nitrogen
Nitric Acid
Iron Wire
Hydrogen
Hydrogen Peroxide
Bromthymol Blue Indicator
Sodium Carbonate
Titration Equipment
Oxygen
Vacuum Source

## Ramsbottom Carbon Residue of Petroleum Products ..... Page 59

ASTM D524; IP 14; ISO 4262; FTM 791-5002

Desiccator
Strainer (100-mesh)
Analytical Balance
Calcium Chloride
Syringe

## Sediment in Crude Oils and Fuel Oils by the Extraction Method ..... Page 61

ASTM D473; IP 53; ISO 3735; DIN 51789; FTM 791-3002

Desiccator
Toluene
Analytical Balance

## Rust Protection by Metal Preservatives in the Humidity Cabinet ..... Page 65

ASTM D1748; FTM 791-5310

Silica Sand
Petroleum Naphtha
Precipitation Naphtha
Methyl Alcohol
Air Supply
Water Supply

## Freezing Point of Aqueous Engine Coolant Solution ..... Page 68

ASTM D1177

Glass Wool
Solid Carbon Dioxide
Liquid Nitrogen